MARCH 1993

WAYS TO SUPERCHARGE WINDOWS

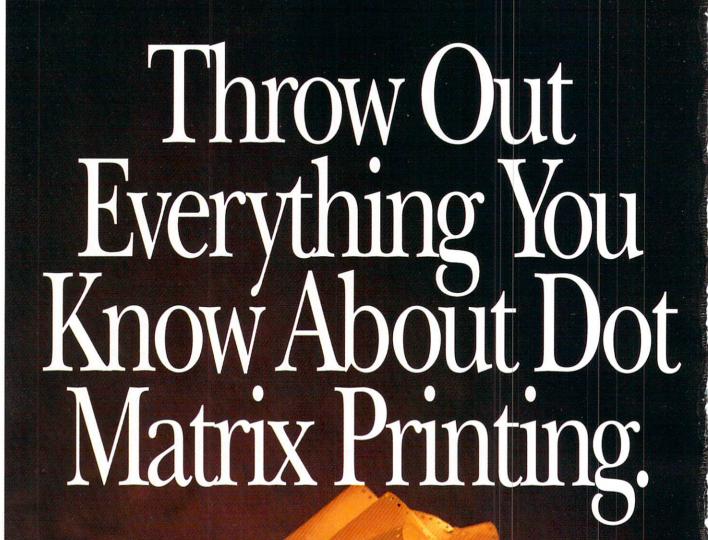
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VOLUME 15, NO. 3, ISSUE 150

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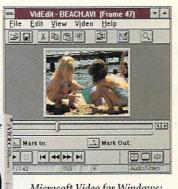
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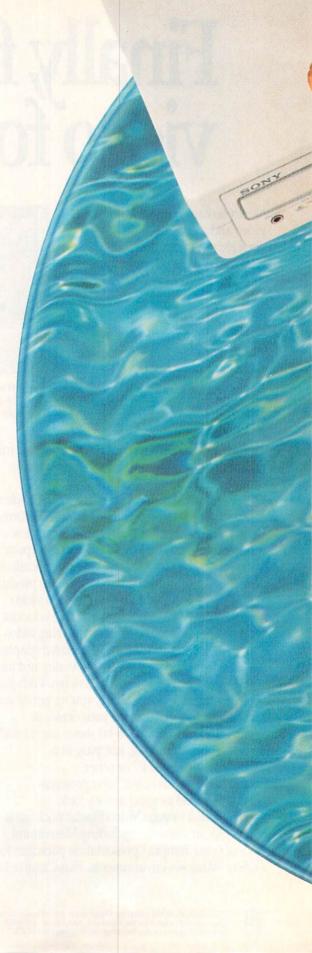
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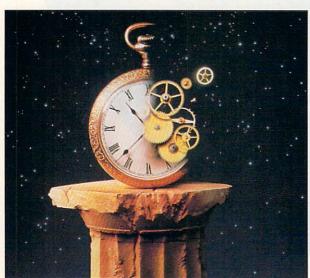
Clifton Karnes

he year 1992 will probably go down in the computer history books as the year of the operating system. We saw Microsoft release Windows 3.1 and Windows for Workgroups, both of which brought the promise of Windows 3.0 to fruition. And we witnessed the release of OS/2 2.0, IBM's much-talkedabout full 32-bit operating system. To counterpunch OS/2 and diffuse its impact, Microsoft also announced Windows NT, that company's full 32-bit operating system, planned to be released by the end of 1992, but delayed.

Usually, we don't know until a year is over whether it was the year of the LAN or the year of the dog, but the writing for 1993 already seems to be on the wall—or, more appropriately, on the desktop.

We'll see 1993 go down in the history books as the year of the Windows database. We saw the first volleys of the database wars in 1992, but big guns are going to be fired in 1993. Here's a guide to the players.

Preseason. In 1992, a couple of amazingly good Windows databases appeared.



The most successful of these is Approach, an easy-to-use database that works with dBASE and Paradox files and uses the Windows interface to great advantage. In fact, we gave Approach a COMPUTE Choice Award as one of the best software products of 1992. And Approach 2.0, the latest version, is this issue's Productivity Choice.

Negotiations. Ashton-Tate invented the PC database market with dBASE way back in the days of CP/M. By 1990, however, Ashton-Tate was in trouble. It was obvious that someone was going to buy the company, but who? Whoever got A-T would get the huge, if somewhat troubled, dBASE market along with it.

Borland jumped in and quickly signed a deal with A-T. Borland already owned a significant piece of the DOS database market with Paradox. Buy buying Ashton-Tate, Borland increased its database holdings to 79 percent of that market.

Microsoft counterpunched by buying Fox Software, makers of the amazingly fast and powerful dBASE clone, FoxPro. Microsoft said there would be a FoxPro for Windows soon.

Pregame. Microsoft realized that bringing a product to market first is a big plus. There was no way to ship FoxPro for Windows in 1992, but the company was able to release Access, a powerful Windows database with an easy-to-use front end like Visual Basic. And Microsoft launched Access at an introductory lowball price of \$99. Watch this one. It may come from behind and surprise us all.

That brings us to two of the biggest players in the Windows 1993 database game: Paradox for Windows and FoxPro for Windows.

Showtime. Microsoft's Ac-

cess may have been released early, but Paradox for Windows was late. Originally planned for early 1992, the product was rescheduled to ship in January 1993. Was it worth the wait? In a word, yes. Paradox is dazzlingly powerful, full-featured, amazingly fast, and, perhaps even more amazing, easy to use.

Paradox for Windows isn't just Paradox for DOS translated into Windows. It's a redesign from the ground up, and it shows. The program makes excellent use of the Windows environment for both developers and end users, and it has the best visual design tools I've seen.

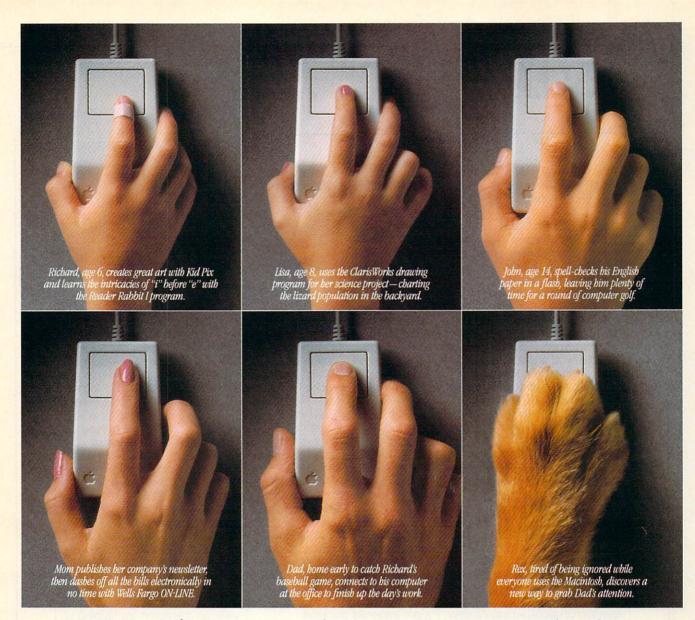
Early reports of FoxPro for Windows, still due to ship as I write this, show it to be an impressive product with the speed and power of its DOS brother and with excellent code compatibility with the DOS version.

In databaseland, while speed isn't everything, it's almost everything, and the question on everyone's lips is, Which is faster, FoxPro for Windows or Paradox for Windows? Based on examination of the DOS products, my guess is that they'll be about the same in speed. Both will work with Paradox DB and dBASE DBF files, and they'll cost about the same—roughly \$795.

So here's a wrap-up of the major Windows database players to watch in 1993. First, there's the preseason star, Approach, and there's the pregame winner, Access. Then, there are the two contenders for the heavyweight title, Paradox for Windows and FoxPro for Windows.

And there's a good chance we'll have an exciting and entertaining halftime show with SuperBase for Windows and Clipper for Windows as headliners.

The year 1993 will go down in the history books as the year of the Windows database.



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Edited by Mike Hudnall Reviews by Tom Benford

ncredibly fast and powerful microprocessors supply the brains and brawn of today's computers. But the beauty of a system-the display your eyes follow hour after hour, day in and day out-can be just as important. And there's much more to a monitor than meets the eye. Should you opt for a larger monitor when you buy your next computer system? Should you upgrade from your present 14inch monitor to a 15-inch or 17inch monitor? What features should you look for, and what problems should you look out for? This month's Test Lab helps by examining ten monitors with a variety of features-three 15inch monitors and seven 17-inch monitors, ranging in price from \$595 to \$1,789.

Knowing what to look for as you shop around is half the battle in your quest for the right monitor. Our grid of monitor features provides you with specifics about dimensions, video modes, operational specs, emissions standards compliance, and FCC certification. In his reviews, Tom Benford offers his expert evaluation of each monitor, commenting not only on performance but on ease of use and the distinctive features of these monitors.

In addition to the standard brightness, contrast, and horizontal and vertical controls, many of these monitors offer a pretty remarkable array of controls that handle everything from barrel and pincushion distortion to magnetization. Because not every application uses the same screen settings, some of these monitors offer factory-preset and user-definable settings. Once you've optimized the settings for a particular application, you can save them. Whenever you call up that application, the monitor automatically recalls the correct settings. With controls like these, not only HITACHI/NISSEI SANGYO AMERICA 800 South St. Waltham, MA 02154 (800) 441-4832 (617) 893-5700 List price: \$795 Warranty: two years, parts and

do you improve the appearance of your apps, but you also work smarter and more efficiently.

For a detailed look at performance, check the grid with the monitor scores for the Video Obstacle Course in DisplayMate Professional. Tom Benford and his team checked each monitor for flicker, bounce, distortion, moirés, and a host of other problems, using the more than 30 tests in the VOC. The "Monitor Test Lab Methodology" sidebar details the lab's testing equipment and procedure, and you'll find a glossary to help you with terms that may be unfamiliar.

If you're in the market for one of these feature-rich, highly capable monitors, read on. The facts, figures, and evaluations in this Test Lab can help you make a more informed decision.

MIKE HUDNALL

HITACHI/NSA SUPERSCAN 15

The physical styling of the Hitachi/ NSA SuperScan 15 monitor is nice and clean, but the monitor's good looks don't end there.

Positioned as an ideal monitor for business graphics and Windows applications, the Super-Scan 15 delivers a 15-inch display in about the same amount of space required by the average 14-inch monitor. A permanently attached pedestal base provides a highly stable tilt-swivel platform while occupying a footprint only about 10½ inches square.

At the rear of the SuperScan 15, you'll find a permanently attached video cable fitted with a standard 15-pin D connector and



an AC power outlet for plugging in the detachable power cord. The manufacturer has placed the adjustment controls at the front of the SuperScan 15, right where they should be for easy reach.

All of the controls occupy an apron that runs beneath the video display and, though not concealed by a door or flip-down panel, aren't visible from the user's perspective. The rotary dial controls are recessed about an inch from the edge of the apron, effectively removing them from view unless you lower your head to the same level as the monitor's base. Icons representing the functions of the corresponding controls appear on the apron lip, helping to keep the SuperScan 15's appearance neat and uncluttered.

As you look from left to right while facing the monitor, you'll see that the control complement consists of vertical position, vertical size, horizontal position, horizontal size, brightness, contrast, and a flush-mounted power switch with embedded LED power indicator. The manufacturer does not provide memory or degaussing circuitry in this monitor.

Generally speaking, the Super-Scan 15 is an easy monitor to look at for extended periods, owing to its bright screen and good resolution. The monitor did, however, have a tendency to bow inward slightly on both left and right sides at the center of the screen and, since there is no pincushion compensation control, not much can be done by the user to correct it. Adjusting horizontal

size and position made it somewhat less noticeable with a few applications, but there was no way of eliminating the inverse barrel distortion of the screen sides. Surprisingly, the screen's geometric linearity was excellent despite this.

Flickering seldom marred the SuperScan 15's display. Even with dot and crosshatch patterns that proved troublesome for other monitors, flickering on the SuperScan 15 was either totally absent or not as severe. The Video Obstacle Course caused the SuperScan 15 to flicker in two of the tests, but every other monitor covered here flickered in those same tests.

If there's an Achilles heel on the SuperScan 15, it must be moiré patterns. While generally very slight and only noticeable on large screen areas containing uniformly gray-shaded areas, the shimmering moirés were nevertheless visible on several of the Video Obstacle Course tests as well as with some DOS and Windows applications. Additionally, I noticed some screen bouncing during the screen and local regulation tests as well as during the mode-switching tests. Despite these problems, however, the SuperScan 15 turned in a very respectable score in the VOC.

If your needs and budget seem to point toward a 15-inch monitor as the best choice for you, then you should definitely consider SuperScan 15.

Circle Reader Service Number 371



IOCOMM THINKSYNC 5 CM-5128

IOcomm's ThinkSync 5 CM-5128 has some features that consumers should find attractive, but it turned in a generally disappoint-

ing performance.

The 15-inch monitor takes up about the same amount of physical space as the average 14inch monitor and weighs in at the relatively light weight of 38 pounds. The CM-5128's physical appearance is Spartan and uncluttered, with all of the display controls ergonomically located at the front of the monitor, just below the display screen. A rocker power switch occupies the lower right corner of the monitor, with a green LED located just above it to signify when the power is on. You'll find it easy to adjust picture characteristics, thanks to convenient placement of the rotary dial controls for brightness and contrast next to the LED. This location proved to be a good one, as adjustment to the image brightness, contrast, or both was frequently necessary to maintain the best viewing characteristics when switching applications.

A drop-down panel door conceals the five additional knob controls, used for adjusting horizontal and vertical size and position; a fifth knob adjusts the screen's geometry (pincushioning). I used all five of these knobs extensively to readjust the screen while switching between DOS-based applications, since the CM-5128 has no digital memory for

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List price: \$595
Warranty: one year, parts and labor

storing preferred settings. Windows applications did not require further adjustment once I set up the initial preferences.

On this monitor, the video cable is detachable. It plugs into the rear of the monitor, along with the

AC power input.

The characteristic of this monitor that I found most objectionable is that the image "runs uphill." Presumably, the CRT isn't mounted perfectly square in the chassis mounting cradle. Whatever the cause, I found it most disconcerting to see the text at the left side of the screen about one-eighth inch lower than that at the right.

The CM-5128 found several of the tests in the Video Obstacle Course to be tough going as well. The display screen exhibited a slight red tinge at the left side and a red and blue tinge at the right side. The screen's uniformity was less than perfect, with variations in brightness in several areas, especially noticeable against light background colors. The screen also displayed better focus at the center than at the edges, along with a tendency toward "blooming" at the center (this was very apparent in test 5 of the VOC—Horizontal Versus Vertical Line Thickness).

Screen flickering and moiré patterns proved to be additional gremlins which made their presence known numerous times—not only during the VOC tests but also in 1024 × 768 mode when hires images with certain dot patterns (shaded gray backgrounds in particular) were being displayed. Streaking and ghosting were also noted, as well as screen regulation weaknesses

Benchmark/performance testing was conducted by Computer Product Testing Services, Inc. CPTS is an independent testing and evaluation laboratory based in Manasquan, NJ. Every effort has been made to ensure the accuracy and completeness of this data as of the date of testing. Performance may vary among samples.



and bouncing when I switched graphic modes.

Because of the "uphill" image and the problems encountered in the Video Obstacle Course, I cannot recommend this monitor.

Circle Reader Service Number 372

MAG INNOVISION MX 15F

If the monitors covered here were in a beauty contest, the MAG InnoVision MX15F would probably walk away with top honors. It is indeed a handsomely styled 15-inch monitor that pleases the eye in many ways.

Devoid of any nonfunctional frills, the cabinet perfectly complements the flat-screen design of the MX15F. A detachable tilt-swivel base provides a stable and easily adjustable support for the monitor, although the unit also has its own rubber feet, which will come in handy if you decide not to use the tilt-swivel base.

MAG's placement of the monitor's controls up front and within easy reach makes sense. Rotary dials at the left side just beneath the video display allow you to adjust brightness and contrast. A flush-mounted power switch with green LED power indicator flanks the right side in the same position under the display.

In the center, a drop-down door conceals the other adjustment controls and indicators, including a digital LED mode indiMAG INNOVISION
4392 Corporate Center Dr.
Los Alamitos, CA 90720
(714) 827-3998
List price: \$899
Warranty: one year, parts and labor;
two years on CRT

cator. A smoked window in the drop-down door lets you see the numerical mode indicator, and four small "portholes" in the door facilitate your monitoring any of the four LED status indicators. If you don't want to see these displays, you can use an auxiliary panel door, which doesn't have any window or portholes in it—a nice extra touch.

Planning to take your monitor abroad? No problem. The MX15F comes with a universal autoswitching power supply, which permits you to plug it in and use it anywhere in the world (you might still need a converter for your PC and other gear, however).

Eight plus/minus push-button controls adjust the picture attributes. You'll use pairs of these controls to adjust vertical size, vertical position, horizontal phase (position), and horizontal size. Additionally, MAG furnishes a program set/recall push button and a slider switch for selecting any of either the eight preset timing modes or eight user-defined modes. Memory recall is automatic for the factory presets with manual override possible.

The illuminated digital display and four LED indicators keep you abreast of the monitor's current mode and status. A single digit (1-8) in the mode indicator identifies the monitor's current video mode. Without the red user indicator illuminated, a number represents a factory preset mode; with the user/preset switch in the up position, the user LED is activated, and the mode indicator reflects which user-programmed mode is active. A green LED labeled SOG indicates when the incoming signal has a composite sync signal, while an amber LED lights up if the input is a composite signal. (These signals are relevant to users of Macs only.) The fourth LED, also red, goes on if the input signal exceeds the monitor's frequency range and the monitor cannot display the image satisfactorily. These features are sure to find favor with users who like to know what's going on at all times with their PC system, but this information probably won't mean too much (if anything) to the average user. That's probably why MAG provides the extra nowindow panel door.

The MX15F's image is bright and well defined with excellent geometric linearity and uniformity across the entire viewing area. The only flaws detected using the Video Obstacle Course were a tendency to show moirés with some patterns, a minor bit of screen regulation deviation, and local distortion and some bouncing while changing video modes. Screen flicker, a weakness detected by the VOC on all the monitors covered here, was also present but not as pronounced or as objectionable as on some of the other monitors

The MX15F has a lot going for it and makes a good choice if you're considering a 15-inch SVGA-capable monitor.

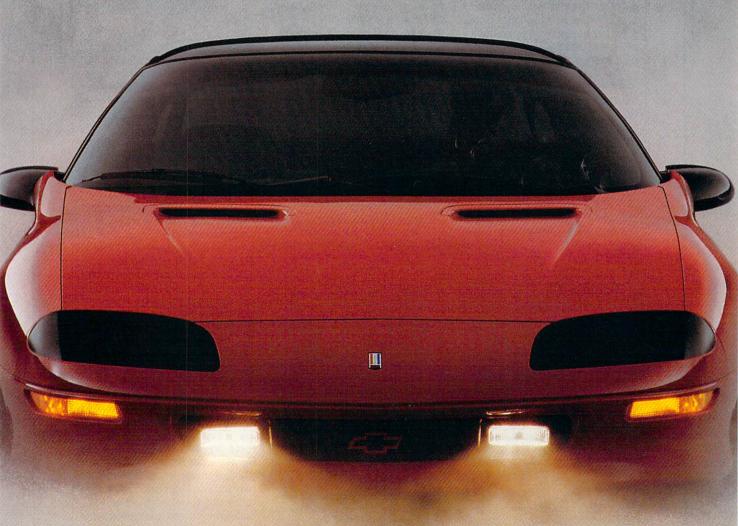
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MITSUBISHI DIAMOND PRO 17

If you're interested in upgrading to a large-screen monitor that has all of the leading-edge technological bells and whistles in addition to a superb image with rock-steady stability, the Mitsubishi Diamond Pro 17 may be just the ticket.

All of the Diamond Pro's controls are conveniently located at the front of the display. A dropdown door occupying the left half of the apron under the display houses some of the controls, while exposed flush-mounted

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push buttons fill up the right half of the apron and complete the control section.

The controls normally concealed behind the panel door include a pair of push buttons used to select the desired function for adjustment; the choices include horizontal position and size, vertical position and size, horizontal static misconvergence, and vertical static misconvergence. Two more push buttons are used to increase and decrease the settings of the selected adjustment, and a memory preset recall switch is located next to them.

The exposed controls consist of a pair of flush-mounted brightness push buttons (an embedded LED on the minus switch lights up when either of these controls is touched), a pair of push buttons for adjusting contrast (again with an embedded LED in

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the minus switch which signifies adjustment activity with either of these controls), and a momentary-contact degauss switch. An illuminated LED power indicator and a flush-mounted power switch complete the lineup of controls. The overall appearance of the monitor is clean and contemporary.

You'll find three connectors at the rear of the monitor: an AC power input connector, a 15-pin D jack, and a special-purpose 13W3



connector, used for connecting the Diamond Pro to a dedicated CAD workstation. This monitor also works with a color Macintosh computer; just use the optional cable/adapter assembly available from Mitsubishi.

A small-footprint (about ten inches square) tilt-swivel base provides a stable platform for the monitor while making adjustments to the viewing angle effortless.

I found the image clarity and stability of the Mitsubishi pristine; color saturation and hue were vibrant and bright without a hint of ghosting, blurring, or streaking. In fact, the only flaws noted during some long sessions with the monitor were its tendency toward some slight barrel distortion (the sides of the screen are wider at the middle than at the top and bottom), with the toe-in appearance more pronounced at the bottom of the screen than at the top. And, as with every other monitor covered here, a screen flicker was also noticeable during two of the DisplayMate Professional tests in the Video Obstacle Course where high-resolution single-line raster images were displayed. The Diamond Pro proved to be unflappable in other VOC tests which were troublesome for other monitors (for example, screen regulation, local regulation distortion, and text-graphics mode switching).

The Diamond Pro is an excellent 17-inch monitor for virtually any type of work, from text to com-

MONITOR TEST LAB METHODOLOGY

To test the 15- and 17-inch monitors featured in this month's lineup, we used a computer system that includes a Mylex i486DX/50 mother-board with 32MB of RAM and 64K internal caching, mounted in a minitower case with a regulated and calibrated power supply from Triton Technologies.

The video card that we used throughout our extensive monitor testing is a Renoir Ultra-SVGA card, which is capable of all modes up to and including 1280 × 1024 with 16 colors and which is equipped with a full megabyte of video RAM and a Sierra HiColor RAMDAC chip for 32,768-color capability. The VESA driver that came supplied with the Renoir Ultra-SVGA card was automatically loaded at boot-up via an included line in the system's AUTOEXEC.BAT file.

Prior to testing, we set up and adjusted each monitor for optimal viewing, using the Setup utility in Display-Mate Professional.

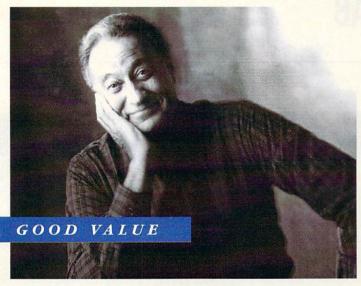
All of the monitor tests were subjective. We conducted them with the DisplayMate Professional Video Obstacle Course test suite, which uses 33 test patterns to uncover video anomalies or substandard performance. We ran this test suite in Display-Mate video mode 105 (1024 × 768 interlaced). The displayed test patterns allowed us to identify common video irregularities, including blooming, defocusing, geometric linearity, moiré patterns, flicker, streaking and ghosting, and other conditions.

Mode 105 was selected for the test suites, as it's a high-resolution interlaced mode which all of the tested monitors are capable of displaying. It also makes certain video maladies such as flicker and ghosting more pronounced and thus more noticeable.

A jury of three CPTS staff members scrutinized each monitor for each test and voted using a 1–10 scale, with lower numbers representing poorer performance and a 10 representing a perfect score. We compiled the votes of these three testers for all of the tests and totaled the results. None of the monitors tested achieved a perfect score, although many scored in the high 9s, indicating excellent performance and viewing.

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	Hitachi/NSA SuperScan 15	IOcomm ThinkSync 5 CM-5128	MAG InnoVision MX15F	Mitsubishi Diamond Pro 17	Optiquest 4000DX
Screen uniformity and flicker	10	8	10	10	8
Freedom from background interference	10	10	10	10	10
Dark screen	10	10	10	10	10
Geometric linearity	8	6	. 10	8	9
Circular test pattern	10	10	10	10	10
Horizontal versus vertical line thickness	10	5	10	10	10
Line brightness versus thickness	9	* 8	10	10	10
Defocusing and blooming	10	8	10	10	10
Raster visibility	8	8	8	8	8
Resolution	8	8	8	10	8
Corner resolution	8	6	9	8	6
Normal and reverse video resolution	10	10	10	10	10
Line moiré pattern	9	8	8	10	8
Fine line moiré pattern	8	8	8	10	8
Dot moiré pattern	9	8	8	10	10
Fine dot moiré pattern	8	8	8	10	10
Horizontal color registration	10	8	10	10	8
Vertical color registration	10	10	10	10	10
Horizontal color registration blink	10	8	10	10	8
Vertical color registration blink	10	10	10	10	10
64 intensities for primary colors	10	10	10	10	10
Color timing	10	10	10	10	10
Digital color timing	10	10	10	10	10
White level shift	10	10	10	10	10 _
Black level shift	10	10	10	10	10
Two-dimensional streaking	10	10	10	10	10
Streaking and ghosting	10	8	10	10	10
Persistence	10	10	10	10	10
Screen regulation	8	8	8	10	8
Local regulation distortion	8	8	8	10	8
Text/graphics switching	8	4	5	10	4

1See the "Monitor Test Lab Methodology" sidebar for a full explanation of how the lab derived the results in this grid.

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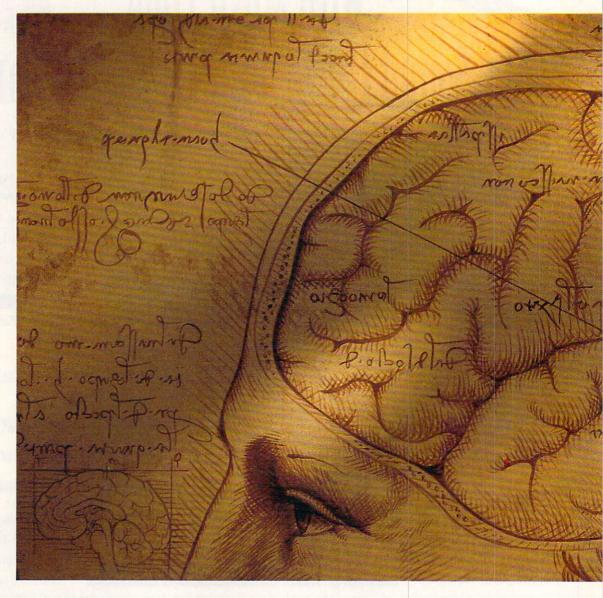
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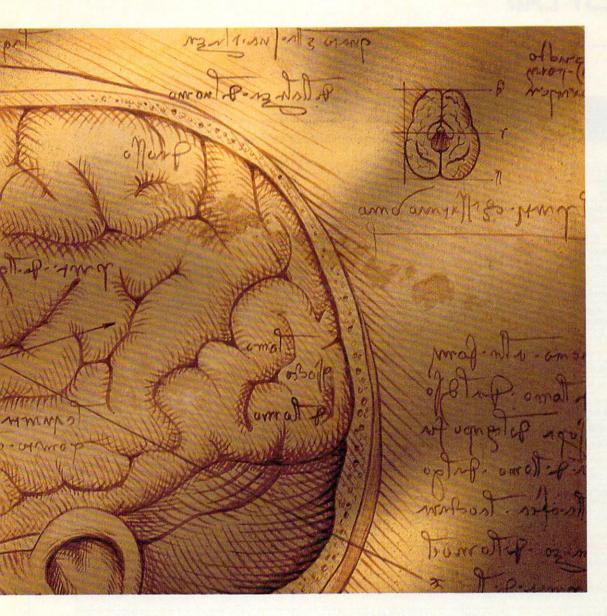
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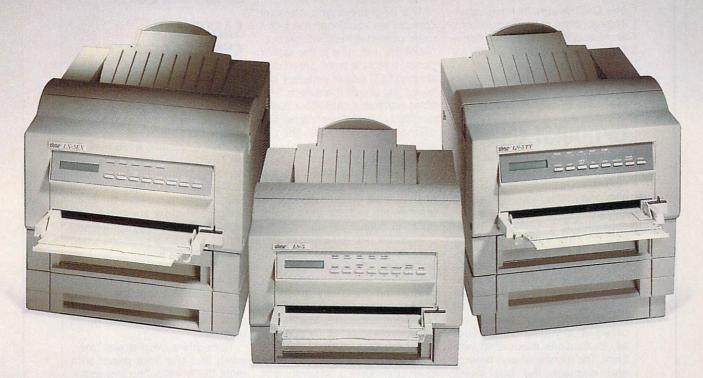
Circle Reader Service Number 108

	Samsung SyncMaster 5C	Samtron SC-726V	Sony CPD-1604S	ViewSonic 7	Zenith Data Systems ZCM-1790
Screen uniformity and flicker	10	10	10	10	6
Freedom from background interference	10	10	10	8	10
Dark screen	10	10	10	10	10
Geometric linearity	7	10	10	10	8
Circular test pattern	10	10	10	10	10
Horizontal versus vertical line thickness	9	10	10	10	10
Line brightness versus thickness	10	10	10	10	8
Defocusing and blooming	10	10	10	10	10
Raster visibility	8	8	8	8	8
Resolution	10	9	8	8	10
Corner resolution	8	6	8	8	8
Normal and reverse video resolution	10	10	10	10	10
Line moiré pattern	10	8	10	8	10
Fine line moiré pattern	10	8	10	8	10
Dot moiré pattern	10	10	10	10	10
Fine dot moiré pattern	10	10	10	9	10
Horizontal color registration	10	8	10	10	7
Vertical color registration	10	10	10	10	10
Horizontal color registration blink	10	8	10	10	7
Vertical color registration blink	10	10	10	10	10
64 intensities for primary colors	10	10	10	10	10
Color timing	10	10	10	10	10
Digital color timing	10	10	10	10	10
White level shift	10	10	10	9	10
Black level shift	10	10	10	10	109
Two-dimensional streaking	10	10	10	9	10
Streaking and ghosting	10	10	10	9	10
Persistence	10	10	10	10	10
	8	8	8	9	8
Screen regulation					
	6	8	9	9	8
Screen regulation Local regulation distortion Text/graphics switching	6	8 10	9	9 4	10

¹See the "Monitor Test Lab Methodology" sidebar for a full explanation of how the lab derived the results in this grid.



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plex CAD design. Its image quality, ergonomic control placement, and extended-range video capabilities make it a good choice for the discerning PC user looking for a superior large-screen video display.

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OPTIQUEST 4000DX

Another 17-inch Super VGA monitor to break the \$1,200 price barrier, the Optiquest 4000DX is also one of the more lightweight 17-inch monitors.

Featuring a 32-mode digital memory (the largest capacity of all the monitors covered here), the 4000DX comes with factory presets for 16 of the major video modes. You can store 16 additional settings (defined by you), all ready to be automatically recalled when you run the particular applications associated with them. The monitor always detects and displays the last mode stored in the user setting area when you first turn it on, and it checks all of the other userstored settings before selecting a factory-set default mode. This negates the need for a manual memory recall switch, so Optiquest doesn't provide one on the 4000DX.

All controls are front mounted and exposed on the monitor, which has an otherwise frill-free appearance. They reside just below the display screen in the apron area of the monitor. To adjust your viewing angle, just use OPTIQUEST 20490 E. Business Pkwy. Walnut, CA 91789 (909) 468-3750 List price: \$1,195 Warranty: one year

the supplied tilt-swivel base. If you elect to bypass the tilt-swivel base, you can set the monitor, which is equipped with four rubber-tipped feet, directly on the PC or desktop.

The brightness and contrast controls are traditional rotary-dial units, located at the right front corner of the unit, next to the rocker power switch; a small green dotshaped LED power indicator appears just above the switch. The other controls include four flushmounted push buttons and five additional green-dot LEDs. The selector push button lets you choose among the five controls used to make adjustments; once you select, the plus or minus push buttons adjust the value. A reset switch restores the original (factory) default value.

In addition to the usual brightness, contrast, and horizontal and vertical size and position controls, the 4000DX also provides a pincushion distortion control to compensate for horizontal and vertical edge curvature, which may occur in some video modes.

The overall picture quality was good, especially when you consider the CRT's .31-mm dot pitch; this is a larger pitch (resulting in a larger pixel) than that of any of the other 17-inch monitors reviewed here. There was a noticeable red tinge at the left screen border and a less objectionable yellowish halo all along the right screen border, which may be indicative of the electron guns being slightly out of alignment. This hypothesis is borne out by the fact that the green alignment was off during two of the DisplayMate Professional tests in the Video Obstacle Course.

The 4000DX also exhibited a

tendency to produce moiré patterns whenever a tight, high-resolution pattern was displayed. Screen flickering was noticeable with hi-res patterns, and the focus at the outer edges and corners of the screen was not as crisp as at the center.

The 4000DX delivers digital memory and a large viewing area at a price that brings it within the affordable range of many PC

Circle Reader Service Number 375

SAMSUNG SYNCMASTER 5C

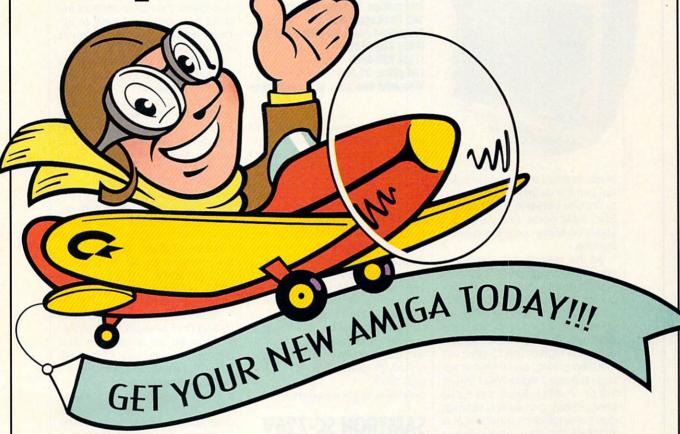
If you're looking for a large, ergonomic monitor ready to handle a variety of applications, you'll want to consider Samsung's Sync-Master 5C 17-inch color monitor.

The 5C features a .26-mm dot pitch, which makes it capable of handling 1280 × 1024 resolution as well as every other VGA and Super VGA mode. With the built-in digital memory, you can switch between video mode screen settings and optimal positions when you switch applications. You can save these settings for instant recall whenever you run a particular application again. The monitor permits storing up to 12 modes, all accessible via the front panel controls.

Beneath a drop-down door, you'll find the front panel with eight LEDs indicating the active functions. These include horizontal image shifting, horizontal image stretching and condensing, horizontal concaving and convexing (barrel distortion), vertical image shifting, and vertical image stretching and condensing (pincushioning).

To select the function you'd like to set or alter, use the function button; up- and down-arrow buttons augment and diminish the settings. A save button stores the current mode and position settings in memory. To demagnetize the screen, ridding it

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of any residual static charge buildup, use the degauss button. And to choose between the D-15 and BNC input ports, use the output selection button next to the arrow buttons

At the rear of the computer, you'll find four discrete BNC connectors (used with Macintosh computers and special-purpose video peripherals) and a 15-pin D connector, along with two slide switches. The first switch selects either the high or the 75-ohm termination setting, and the other selects the input signal level (either 1.0 or .7 volts). Since the cable connections and switch settings don't change once the monitor is installed, the rear of the unit is a good location for these items.

A flush-mounted power switch with a built-in LED indicator is conveniently located at the lower right corner of the monitor, and Samsung has also placed the brightness and contrast controls here within easy reach for making any desired viewing adjustments. Ergonomically, the monitor rates a 10 for its well-placed control layout and easily adjustable tilt-swivel stand.

During testing (see the "Monitor Test Lab Methodology" sidebar), a few weaknesses of the 5C became apparent. The monitor had a marked propensity to bow inward slightly at both the left and right sides of the screen, although the bowing at the left side was considerably more pronounced.

The monitor also exhibited an annoying flicker on the tight res-

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olution (single-line) patterns of the raster visibility and corner resolution tests, which detracted slightly from its overall performance scores. It also exhibited bowing during the screen regulation and local distortion tests, and it was totally unable to successfully complete the text/graphics mode-switching test in the Video Obstacle Course, blanking the screen completely during the test. These weaknesses affected its overall performance score.

Aside from these flaws, this large-screen monitor is handsomely styled and provides an excellent display for virtually any type of textual, graphics, CAD, or design work.

Circle Reader Service Number 376

SAMTRON SC-726V

Samtron packs plenty of good features into its SC-726V monitor, while keeping the appearance utilitarian and simple.

Samtron provides rotary controls for degauss, horizontal size, vertical size, horizontal shift, vertical shift, brightness, contrast, and power. These controls extend inconspicuously beneath the apron on the front of the monitor and are identified by a series of embossed icons. Although a novel departure from the push buttons and slide switches found on

SAMTRON DISPLAYS
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La Mirada, CA 90638
(310) 802-8425
List price: \$1,199 (A low-radiation model, the SC-726VL, is available.)
Warranty: one year, parts and labor

many other monitors of this size and class, the rotary controls are quite functional and easy to access, which is what really counts in the final tally.

Samtron places a switch for manually selecting either 110-V or 220-V operation at the rear of the unit, along with a nondetachable cable fitted with a 15-pin D connector. A socket for inserting the detachable AC power cord completes the list of items found at the rear of the monitor:

The SC-726V doesn't come with digital memory or the ability to store user-defined screen settings. The monitor is equipped, however, with autosizing circuitry, so the absence of digital memory won't be a major issue for most users. The autosizing worked just fine with all of the applications I ran during my evaluation.

I found the overall image quality and display resolution surprisingly good for a monitor with such a low price tag. Aside from a tendency to produce moirés on high-resolution screen patterns. the image definition and clarity were certainly acceptable. The DisplayMate Professional Video Obstacle Course detected a slight misalignment of the blue gun registration on two of the tests. Local screen regulation and distortion are other areas that caused the SC-726V to receive less than perfect scores.

Samtron produces two varieties of the SC-726V. The standard version is the one supplied for this review, but the company



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1024 × 768	15 14.88 × 14.09 × 16.29 36.0 fixed	15 13.97 × 14.65 × 15.50 38.0	15	Diamond Pro 17	4000DX
Dimensions (HWD, in inches) Weight (in pounds) Fixed/detachable video cable IODES 1024 × 768	14.88 × 14.09 × 16.29 36.0	13.97 × 14.65 × 15.50		PROPERTY OF THE PARTY.	
inches) Weight (in pounds) Fixed/detachable video cable IODES 1024 × 768	× 16.29	× 15.50	10.00 11.00	17	17
Fixed/detachable video cable IODES 1024 × 768		30.0	13.80 × 14.00 × 16.30	10.02 × 16.14 × 17.32	16.80 × 16.1 × 18.10
cable IODES 1024 × 768	fixed	36.0	36.3	47.4	41.8
1024 × 768		detachable	fixed	detachable	fixed
	ACHIEVA (C				100 May 14 May 15 May 1
noninterlaced	-		-		•
Super VGA					
VGA (640 × 480)				6	
MCGA					•
PERATIONAL SPECS					有对性性
Maximum noninterlaced resolution (pixels)	1024 × 768	1280 × 1024	1280 × 1024	1280 × 1024	1280 × 1024
Vertical scanning frequency range (Hz)	50–100	40–100	50–120	50-130	50-90
Horizontal scanning frequency range (kHz)	30–58	30–65	30-68	30–64	31–60
Phosphor ¹ s	short persistence	short persistence	medium short persistence	short persistence	short persister
Dot pitch or aperture pitch (mm)	0.28	0.28	0.28	0.26	0.31
ONTROLS					Eller Hold
Brightness					
Contrast					
Horizontal position	•			-	
Vertical position					7
Horizontal size					•
Vertical size	•				•
Pincushioning			0		
Memory save	0	0	.		
Automatic sizing	I			•	-
Degaussing	OMPLIANCE				
MISSIONS STANDARDS CO	MARKATA CARE PARTICIPATE				
MPRII-VLF		0			-
MPRII-ELF		0	0	-	
CC CERTIFICATION CLASS					
CO CENTIFICATION CLASS					
	В	Α	В	A	В

	Samsung SyncMaster 5C	Samtron SC-726V	Sony CPD-1604S	ViewSonic 7	Zenith Data Systems ZCM-179
GENERAL					
Screen size (in inches)	17	17	17	17	17
Dimensions (HWD, in inches)	17.50 × 16.50 × 17.90	16.00 × 16.00 × 16.80	14.00 × 13.75 × 16.13	16.69 × 16.25 × 17.00	16.64 × 17.49 × 17.99
Weight (in pounds)	48.3	48.5	44.0	42.7	56.0
Fixed/detachable video cable	detachable	fixed	fixed	detachable	fixed
MODES					
1024 × 768 noninterlaced	-	1	-		
Super VGA	L. L.				
VGA (640 × 480)					
MCGA	Þ				
OPERATIONAL SPECS					
Maximum noninterlaced resolution (pixels)	1024 × 768	1024 × 768	1024 × 768	1280 × 1024	1024 × 768
Vertical scanning frequency range (Hz)	45–90	50–90	50–87	50–90	52–97
Horizontal scanning frequency range (kHz)	30–60	31.5–56.4	30–57	30–64	31–57.51
Phosphor ¹	short persistence	short persistence	short persistence	RGB short persistence	short persistence
Dot pitch or aperture pitch (mm)	0.26	0.26	0.25	0.28	0.26
CONTROLS					
Brightness					
Contrast				•	
Horizontal position	5 4				
Vertical position			D		
Horizontal size					
Vertical size					
Pincushioning		0	a		
Memory save			0		
Automatic sizing	•				-
Degaussing					
EMISSIONS STANDARDS	COMPLIANCE				
MPR					
MPRII-VLF	0	0		•	
MPRII-ELF	0				
FCC CERTIFICATION CLA	SS				
	В	В	В	В	В

also produces the SC-726VL, which is the low-radiation model. The VL model features very low magnetic fields of less than 25 milligauss when measured 20 inches from the screen. This makes the VL model compliant with the Swedish MPR-II emission stan-

dards. Excessive radiation emissions are a significant concern for many PC users nowadays. Spending the extra dollars for the VL model, you can buy affordable peace of mind.

If you're itching to move up to a 17-inch monitor that is capable

of running all of the current and emerging video display modes but the bottom line is a major factor in you purchasing decision, the SC-726V (or VL) may be the monitor you seek. It's certainly worth a look!

Circle Reader Service Number 377

MONITOR GLOSSARY

barrel distortion. In monitors and TV receivers, barrel distortion makes all four sides of the image curve out like a barrel.

degausser. A device that clarifies the color picture by means of coils within the set. The coils eliminate the magnetization which builds up around the monitor when it's moved around or when other electrical devices are brought too close to it.

flicker. An unevenness and rapid fluctuation in the overall picture intensity, particularly noticeable in shaded areas of an image but less intense than strobing. Flickering is produced when the field frequency is insufficient to completely synchronize the movement of the images.

interlaced display. A monitor in which the electron beam refreshes (updates) all odd-numbered scan lines in one sweep of the screen and all even-numbered scan lines in the next. Interlacing takes advantage of both the screen phosphor's ability to maintain an image for a short time before fading and the tendency of the human eye to average, or blend, subtle differences in light intensity. By refreshing alternate sets of lines on the display, interlacing halves the number of lines that must be updated in a single sweep of the screen and also halves the amount of information that must be carried by the display signal at any one time. Thus, interlacing updates any single line on the screen only 30 times per second, yet it provides the equivalent of a 60-cycles-per-second refresh

moire. A wavy or satiny effect produced by the convergence of lines. A moiré pattern is a natural optical effect when the converging lines in a picture are nearly parallel to the scanning lines. To a degree, this effect is sometimes due to the charac-

teristics of the monitor's or TV's picture tube, although scanning frequencies and synchronization signals are more frequently responsible for the phenomenon.

multisync display. A monitor able to respond to a wide range of horizontal and vertical synchronization rates. Multisync monitors, also sometimes called multiscan monitors, are versatile in that they can be used with a wide variety of video adapters, since they can automatically adjust to the correct synchronization rate of the video signal.

noninterlaced display. A display in which the electron beam scans each line on the screen once during each refresh cycle. Noninterlaced displays effectively pay attention to every pixel on every line of the screen as the electron beam sweeps across and down the inner surface of the screen, refreshing the displayed image several times each second. This feature greatly reduces flicker, strobing, and user eyestrain, making noninterlaced displays preferable to interlaced displays.

persistence. A characteristic of some light-emitting materials (such as the phosphors used in CRTs) that causes an image to be retained for a short while after being irradiated (for example, by an electron beam in a CRT). The decay in persistence is sometimes called luminance decay. If the persistence of a phosphor is too short, the tendency of an image to flicker is increased; if the persistence of the phosphor is too long, images tend to smear on the screen.

phosphor. Any substance capable of emitting light when struck by radiation. The inside surface of a CRT screen is coated with a phosphor that, when excited by an electron beam, displays an image on the screen.

pincushion distortion. With this kind of distortion, the four sides of the image are curved inward, leaving the corners extending outward.

pixel. Short for picture element. One spot in a rectilinear grid of thousands of spots that are individually "painted" to form an image produced on the screen by a computer. Just as a bit is the smallest unit of information a computer can process, a pixel is the smallest element that a monitor and software can manipulate in creating letters, numbers, or graphics.

raster. A rectangular pattern of lines. On a video display, the horizontal scan lines from which the term raster scan is derived.

RGB. Short for *Red*, *Green*, *Blue*, a mixing model, or method of describing colors, used with many color monitors (or other light-based media as opposed to printed media). RGB uses the additive primaries method, mixing percentages of red, green, and blue to get the desired color. Adding no color results in black; adding 100 percent of all three colors results in white.

scan. In TV and computer display technologies, to move an electron beam across the inner surface of the screen, one line at a time, to light the phosphor that creates the displayed image.

scan line. On a TV or raster-scan computer monitor, one of the horizontal lines on the inner surface of the screen that is traced by the electron beam to form an image.

Super VGA. A superset of display modes which extend the resolution and color palette beyond VGA. Resolutions of 800 × 640, 1024 × 768, 1280 × 960, and 1280 × 1024 with palettes of 16 and 256 colors are included in the Super VGA ranges.

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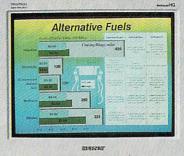
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SONY CPD-1604S

The names Trinitron and Sonv have become synonymous in the public mind in the 20+ years since Sony introduced its first Trinitron TV. Over 40 million Trinitrons have been sold worldwide since then, which might lead you to believe that Sony is doing something right. The dazzling display and excellent performance of the Sony CPD-1604S, which is based on Trinitron technology, provide solid testimony that Sony is. indeed, doing something right.

The 1604S has a flat screen diagonally measuring 17 inches. For its CRT size class, it boasts the narrowest dot pitch in the industry, an impressively fine .25 mm, delivering a crisp, finely resolved image approaching photographic quality in the Super VGA modes.

Mounted atop a highly stable tilt-swivel platform base, the 1604S puts the power switch, illuminated power LED, and rotary brightness and contrast controls at the front of the unit within easy reach just beneath the display itself. This gives the monitor a very

clean, uncluttered look.

The automatic sizing switch and controls for adjusting horizontal and vertical size, horizontal shift, and vertical centering all reside in a recessed well at the left side of the monitor, about midway between the front and rear. Any adjustments to these controls will require either getting up and going over to the side of the monitor

SONY 655 River Oaks Pkwy. San Jose, CA 95134 (800) 352-7669 List price: \$1,789.95 Warranty: one year, parts and labor: two years on Trinitron tube

or, if space and cabling permit it, rotating the monitor on its swivel base 90 degrees to gain access to these controls. While these controls shouldn't normally require adjustment, it would be nice to have them up front at arm's reach should the user wish to do some tweaking. In fairness, however, the automatic screen-sizing circuitry worked well for all of the applications I ran during the review process: I found no reason to override the monitor's automatic control.

The rear of the 1604S houses the AC input connector jack as well as the video signal cable fitted with a 15-pin D connector. No degauss or memory setting or recall functions are included in this model.

The display of the monitor is truly outstanding, thanks to the ultrafine dot pitch and the black matrix background, a standard feature of the Trinitron technology. Virtually every type of image, from straight text to the most complex CAD drawing or 24-bit color TIF file, looks superb when viewed on this monitor.

The Video Obstacle Course in DisplayMate Professional once again proved to be a tough proving ground, especially in mode 105 (1024 × 768 with 256 colors). In this mode some flickering became evident on two of the tests which use very high-resolution one-line raster segments. During

VIEWSONIC 20480 E. Business Pkwy. Walnut, CA 91789 (909) 869-7976 List price: \$1,299 Warranty: one year, parts and labor the screen regulation and local distortion tests, I noticed some bowing and bouncing as the test image blinked, and there was also some bouncing as video modes changed from text to graphics and back again during the last test in the series.

If you're thinking of moving up to a 17-inch Super VGA monitor, the 1604S should look really good to you. After all, it's a Sony.

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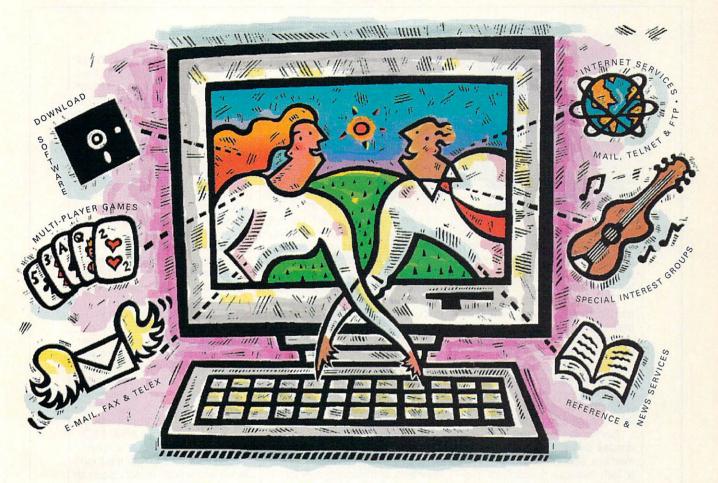
VIEWSONIC 7

A 17-inch display, noninterlaced resolution as high as 1280 x 1024, and a 26-setting digital memory are just a few of the ViewSonic 7's attractive features. Mounted atop a small-footprint (ten inches square) tilt-swivel base, the ViewSonic 7 is attractively styled in a two-tone beige and putty color scheme. The manufacturer front-mounts all the monitor's controls for easy access, starting with a flush-mounted power switch and LED. Just below the power switch, you'll find plus and minus push buttons for adjusting the brightness, along with another pair for adjusting the contrast setting.

A drop-down panel door to the left of these controls conceals the remainder of the display controls. These controls consist of a pair (augment and diminish) of push buttons for horizontal position, a



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pair for horizontal size adjustment, a pair for vertical position, another pair for vertical size adjustment, and a single push button for memory.

The rear of the unit provides access to the AC power connector and to a 15-pin D connector for attaching the video connector cable. Since this monitor is a multifrequency unit, you can also use it with color Macintosh computers and special-purpose CAD workstations simply by substituting the appropriate connector cable.

Twelve factory-preset timing modes are stored in the digital memory, and ViewSonic reserves a 13th memory position for custom timings in 1280 × 1024 resolution. You also have blank memory areas for storing 13 additional user-defined modes, and, if you like, you can override and reprogram all of the factory presets.

The memory recall is autosensing, which means that the monitor's sensing circuitry analyzes the signal coming from the video card and then compares it to its memory listing of preset (both factory and user) modes. When the circuitry finds the matching setting for that signal, the monitor displays the image according to those settings. Each memory storage area can contain data regarding the horizontal and vertical frequencies, horizontal and vertical polarization, and horizontal and vertical position.

Creating a custom memory setting is a simple procedure that merely involves adjusting the picture size and position exactly the ZENITH DATA SYSTEMS° 2150 E. Lake Cook Rd. Buffalo Grove, IL 60089 (800) 553-0331 List price: \$1,219 Warranty: one year

way you like it and pressing the memory button to register the current mode settings. The next time you run that application, the autosensing circuitry will retrieve the settings and set up the display according to these preferences.

For a monitor with such laudable specifications and features, the ViewSonic 7's display was somewhat disappointing. While color, focus, and geometric linearity were all excellent on the monitor's bright, large screen, the screen exhibited a pronounced tendency for generating moirés with many high-resolution images and screen backgrounds. The ViewSonic 7 was also prone to flicker on tight-resolution patterns. This was particularly noticeable along the horizontal scroller bar in Microsoft Works and other Windows applications running in 1024 × 768 256-color mode using a Renoir Ultra-SVGA card. The monitor didn't rapidly make smooth transitions from text to graphics modes and back again either, producing more than a slight bounce and generating video "noise" on the screen during that segment of the Video Obstacle Course. Otherwise, it's a nice monitor that's handsomely styled and fully compliant with all of the current low-radiation standards.

Circle Reader Service Number 379

ZENITH DATA SYSTEMS ZCM-1790

Zenith Data Systems (now a Bull company and no longer part of Zenith Electronics) presents its ZCM-1790 monitor as an ideal display for multimedia, CAD/CAM, and other high-resolution graphics applications.

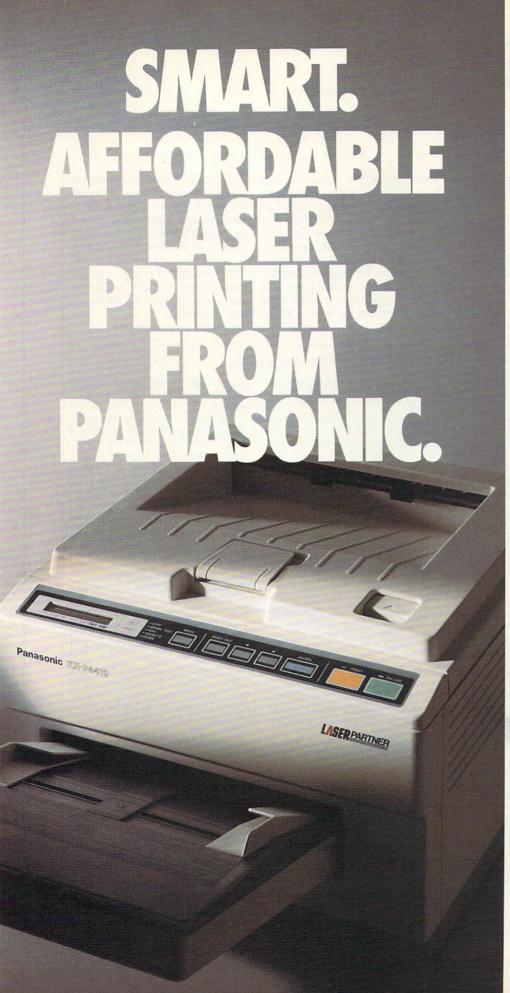
The 17-inch monitor is housed in a very large cabinet that provides a 2-inch border on all four sides of the display, making it look larger than it actually is. This illusion is furthered by the monitor's tilt-swivel base, which occupies a good amount (approximately 12 inches × 13 inches) of desktop real estate itself. Size aside, the styling of the ZCM-1790 is functional, if somewhat Spartan.

Zenith places all of the controls within easy reach at the front of the monitor, just below the display screen. All controls are exposed and visible at all times; there's no drop-down panel to conceal them on the ZCM-1790.

All of the adjustment controls, including brightness and contrast, are push buttons rather than the wheels, knobs, or dial controls more commonly used. These push buttons are almost flush mounted. In addition to an LED power indicator next to the rocker On/Off switch, the manufacturer provides five other LEDs to designate which function control you've selected with the function-selector push button. Each of the adjustments is represented by an icon just above its corresponding LED, and the controls include vertical and horizontal size and position, in addition to brightness and contrast. An adjustment reset function resets all display adjustments to their default settings.

The video cable, with a standard 15-pin D connector, attaches permanently to the rear of the monitor, although the AC power cable is detachable.

The ZCM-1790 uses a flat screen based on flat-tension-mask technology, which, according to company literature, provides "excellent linearity." Using the tests in the DisplayMate Professional Video Obstacle Course in mode 105 (1024 × 768 with 256 colors), I found that the ZCM-1790 did not appear to live up to these claims, producing a noticeable bowing at the top of the



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screen. The display adjustment controls were unable to eliminate or compensate for it.

The review unit also displayed a reddish area (which can best be described as a rouge spot) about three inches in diameter at the lower left quarter of the screen. Again, I found no way to eliminate this problem using any of the monitor's controls. While this didn't seem to affect the per-

formance of the monitor, it was somewhat distracting and was noticeable, even to the casual observer. I suspect that this rouge-spot phenomenon has something to do with the alignment of the monitor's red electron gun; I base this suspicion on the fact that the horizontal color and blink registration proved less than optimal in the Video Obstacle Course.

The screen gives the illusion of being slightly concave, although it's absolutely flat (I put a metal straightedge against the screen to check it). Apart from the slight bowing at the top of the screen and the rouge spot, the ZCM-1790 provides a bright, colorful display, and the CRT's .26-mm dot pitch provides excellent image resolution.

Circle Reader Service Number 380

ABOUT DISPLAYMATE PROFESSIONAL

If you happen to be a regular reader of the Test Lab section of COM-PUTE, then you may recall my sidebar describing the original Display-Mate software product that was used for benchmarking and reviewing the monitors and video cards in the August 1992 issue. I thought that the original DisplayMate was an excellent product, and it was immediately inducted into our arsenal of test and evaluation utilities. Now, Sonera Technologies has taken a good thing a step further (several steps, actually) by adding extended VGA capabilities and a load of other nifty features in its new product, DisplayMate Professional.

Like the original version of the software, DisplayMate Professional provides a complete set of utilities for setting up, evaluating, testing, and adjusting your monitor and video adapter to get optimal performance. And because it supports all VESA-compatible Super VGA graphics modes including 800 × 600, 1024 × 768, and 1280 × 1024 in both 16-and 256-color modes, DisplayMate Professional is an indispensable tool for evaluating the performance of SVGA-capable monitors.

A nifty reporting feature has been added to the test suites so you can give the hardware being tested a numerical performance rating for each test. You can also include a single-line commentary on any peculiarities or on anything else you feel is pertinent. The test files can be saved to disk and printed using your favorite word processor. Having a hardcopy of your test results, complete with numerical ratings and comments, makes it very handy and easy to draw comparisons among several dif-

ferent pieces of hardware when you go shopping for a monitor or video card.

Although the lab's copy of Display-Mate Professional lacked the finished packaging and a printed manual (we received one of the early copies), the documentation did include a line-printer draft of the actual user manual. If it's any indication of the finished product, you can expect a well-organized, thorough, and clearly written manual.

Displays that meet with your approval at 640 x 480 don't always fare so well at the higher resolutions; 1024 × 768 and 1280 × 1024 modes really separate the wheat from the chaff when it comes to monitor performance, and that's where DisplayMate Professional excels. It's been designed and tested to run all of the VESA Super VGA graphics modes and adapters, and it's the only product currently available that can do so. The Video Obstacle Course test suite in these extended modes is positively grueling, and it really puts a monitor through its paces unmercifully.

In addition to the extended-mode test suites that comprise the package, numerous enhancements to the user interface of the program have been added to make it even easier and more versatile to use. You can customize, completely control, and even automate the test execution of DisplayMate Professional by creating simple user-defined command files. Constructing these files is very simple, consisting in most cases of merely specifying the name of the desired test along with the optional command line switches to include or exclude any special parameters, including the video mode the test will be run in and whether to keep a test report log.

The tests, video patterns, and VESA modes available make Display-Mate Professional one of the most sophisticated utility software products I've seen to date, yet it's so easy to use with its online help and prompts that even a novice user can test video hardware successfully within a few minutes of opening the package.

The \$249 list price for the package may seem a bit steep at first, until you consider that spending only 10 hours a week staring at your computer monitor adds up to over 1500 hours in a three-year period. That's a long time to be viewing a screen that isn't properly adjusted or suffers from flickering or other anomalies that contribute to eyestrain.

And if you're considering the purchase of one of the larger-screen monitors, like the 15- and 17-inch monitors covered in this Test Lab, purchasing a copy of DisplayMate Professional will prove to be a sound investment when you go shopping and want to measure monitors using the same performance "yardstick." With large-screen monitors selling at or over the \$1,000 mark, you shouldn't purchase one blindly. DisplayMate Professional provides a clear picture of which hardware looks the best. If you'd like to order DisplayMate Professional, contact Sonera Technologies in Rumson, New Jersey, at (800) 932-6323 or (908) 747-6886.

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NEWS & NOTES

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Molecular Storage

CD players with multiple-disc changers can give you several hours of screaming guitars or whispering cellos-whichever you prefer. But imagine being able to store your entire music library on a single disc with the option of days-or even weeks-of continuous play with no repetition.

It sounds amazing, but researchers at the Department of Energy's Oak Ridge National Laboratory have developed a technology called surfaceenhanced Raman optical data storage (SERODS) with a

disc's surface being physically riddled with "peaks" (0s) and "valleys" (1s). The disc is read by a detector that distinguishes between laser light reflected from the peaks and light scattered by the valleys.

By comparison, a SERODS disc is based on an optical effect in which laser light shines on a molecule, and the molecule vibrates and scatters the light. The scattered light modulates at a frequency corresponding to the molecule's vibration, an effect called Raman scattering. When molecules are close to

> a microstructured metal surface, their Raman scattering is enhanced up to 100 million times. This phenomenon is known as surface-enhanced Raman scattering, or SERS, and it serves as the basis on which sur-

face-enhanced Raman optical data storage operates. Because data is stored at the molecular level (no physical alteration such as burned-in pits occurs; molecules are simply manipulated), a SERODS disc dramatically outperforms ordinary discs.

Organizations in both government and private industry-including the entertainment industry-are now pursuing licensing agreements to use SERODS technology. That means you might soon be able to forget about a CD carrying case for your car's new Discman. Your entire music collection will play from one 12-inch CD. For more information, contact Oak Ridge National Laboratories Public Affairs, Attn: Darryl Armstrong, P.O. Box 2008, Oak Ridge, Tennessee 37831-6266; (615) 574-4160 (voice), (615) 574-0595 (fax).

TV in a PC

Picture-in-Picture television has been around for a couple of years now, but what would you think about a television picture in a window on your computer screen? If the idea sounds too futuristic-and expensive-to be true, think again. A mere \$299 will buy WatchIT! va video board that lets you watch your favorite television programs on your PC screen while you work in any Windows or DOS application. Sounds complicated? Assuming your VGA card has a feature connector (most VGA boards do), the board installs in your computer in minuteswith only a screwdriver.

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(Compter Game Review, Oct. 1992)

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NEWS & NOTES

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modem interface.



780 Boston Road, Billerica, Massachusetts 01821-5925; (508) 663-0666 (voice), (508) 663-6678 (fax).

Lure of the Liberated

The effects of women's libspecifically, where equal representation is concernedare finally trickling down to one traditionally male-dominated area of computer role-playing games: that of the villain (or in this case, the villainess). Not that any male adversary has ever been labeled a "tempter," but at least in Konami's latest release, Lure of the Temptress, developed by Revolution Software, the primary antagonist, Selena, has enough dirty deeds up her spiteful sleeves to out-evil the best of her macho peers.

To make matters even more interesting, Lure of the Temptress is played in Virtual Theatre, the latest in artificialintelligence technology, where the game world advances and develops in realtime, evolving independently of your actions. Other characters take on a life of their own. and you never know what might happen. However, instead of controlling only your own character (a peasant, in this case), you're allowed to give commands to other characters as well, a key element to the game's outcome. In the medieval village of Turnvale, where your primary mission is to defeat the nefarious Selena, your actions affect rather than dictate what happens.

The driving force behind your desire to defeat Selena? If you guessed the very clichéd "to rescue a captive princess," give yourself a gold ball and chain. Perhaps the princess should take lessons from the liberated Selena.

Suggested retail price for Lure of the Temptress is \$49.95. If you would like more information, contact Konami, 900 Deerfield Parkway, Buffalo Grove, Illinois 60089-4510; (708) 215-5100 (voice), (708) 215-5122 (fax).

No Mo' Modem Blues

Probably one of the most galling problems of portable computing is making peace with all the different kinds of hardware you encounter on the road. Say goodbye to the frustration of trying to connect your modem to a hotel telephone—or even to your office system. Unlimited Connections' KONEXX Konnector Model 112, a tiny, portable modem-interface device, is so simple to use you won't lose your cool when it's time to send data through your modem or fax board. The Model 112 lets you quickly and easily connect your computer's modem to almost any PBX, multiline, hotel, or motel telephone, including digital systems.

The Model 112 connects to a telephone line through your phone's handset-between the coiled handset cord and the base of the telephoneto provide an RJ-11 interface to the modem. In the office. the Model 112 eliminates the need for an expensive dedicated line. When out of the office, it operates from an internal battery, allowing you to send data from most hotel and office phones. With the included adapter, you can even connect to phones with the older hardwired handsets.

To use, you simply plug the short cord on the Model 12 into the handset-cord jack on the telephone base, plug the coiled cord from the handset into the handset jack on the KONEXX Konnector, and plug the telephone cord from the computer or fax machine into the dataport jack on the Konnector.

Powered by an internal 9-volt battery or the included AC adapter, the Model 12 Konnector features automatic voice/data switching and transfers data between 1200 and 9600 baud. Suggested retail price is \$149. For more information, contact Unlimited Systems, 5555 Magnatron Boulevard, Suite J, San Diego, California 92111; (619) 277-3300 (voice), (619) 277-3305 (fax).

Companies or public relations firms with items of interest suitable for "News & Notes" should send information along with a color slide or color transparency to News & Notes, Attn: Jill Champion, COMPUTE Magazine, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.



he 1993 Great Treasure Hunt is on, and it's easy to enter. HOW TO PLAY: Each of the dozen picture discs shown on this page is a portion of a photo or illustration in an advertisement appearing in this issue of OMNI. To solve the Treasure Hunt, find the ads from which the discs were taken, and note the page number for each. If an ad appears on the inside or outside of the front or back cover, count that page number as zero. If there is no page number, turn to the **next numbered page** and use that number. If there is no numbered page between the ad and the end of the magazine, stop at the inside back cover, and use zero as your page number. Then add up all 12 numbers. That is the solution you'll need to enter.

Now, print your name, address, daytime phone number, and the solution on a 3" x 5" piece of paper. Mail your entry to: Treasure Hunt/COMPUTE, P.O. Box 612, Gibbstown, N.J. 08027. Hurry — entries must be received no later than 5/31/93. Good luck!

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necessary due to availability. Licensing, transportation, registration, and dealer charges on the automobile and motorcycle prizes are the winner's responsibility. Winners will be required to pick up these prizes from the nearest dealership. Travel to and from Tokyo must take place Monday —Thursday; dates subject to availability. Travel to and from ANA U.S. gateways not included. Travel is not available 8/1/93 — 8/31/93 and 12/20/93 — 1/10/94. Blackout dates are subject to change, and additional

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days of date on notification letter or alternates will be selected at random. Limit one winner per household. Except where prohibited, win-ners agree to use of their names

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For solutions, send a self-addressed stamped envelope to: "Treasure Hunt" Solutions, P.O. Box 526, Gibbstown, N.J. 08027 by 4/30/93; no return postage required for residents of VT and WA. For a list of winners, send a self-addressed, stamped envelope to: "Treasure Hunt" Winners, P.O. Box 743, Gibbstown, N.J. 08027 by 6/30/93. Winners List requests will be fulfilled after the sweepstakes ends.

GIFT FINDER'S GUIDE. For information on the products and services seen in the Great Treasure Hunt, contact the following companies:1993 Chevy Camaro Z28: Contact your local Chevrolet dealer. Boston GP-178 grand piano: The Boston Piano Company, 37-11 19th Avenue, Long Island City, N.Y. 11105 Tel: 1-800-842-5397; For All Nippon Airways: Contact your travel consultant or call ANA at 1-800-2-FLY-ANA (1-800-235-9262); Honda Nighthawk 750 Motorcycle: American Honda Motorcycle, 1919 Torrance Blvd., Torrance, Ca. 90501-2746; Hitachi 50-inch Ultravision TV: Hitachi Home Electronics (America), Inc., 3890 Steve Reynolds Blvd., Norcross, Ga. 30093 Tel: 1-800-HITACHI; NEC Multimedia Gallery: NEC Technologies, 1255 Michael Drive, Wood Dale, Ill.60191 Tel: 1-800-NEC-INFO; CASIO Poseidon Watches: Casio, Inc., 570 Mt. Pleasant Avenue, Dover, N.J., 07801 Tel: 1-800-962-2746.



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FEEDBACK

Being Constructive

I'm looking for software for the construction trades. Can you give me the name of a company that makes this kind of specialized software? DWIGHT HOLMAN LITTLE ROCK, AR

Check out Timberline Software, 9600 SW Nimbus, Beaverton, Oregon 97005; (503) 626-6775. Timberline also produces specialized software for property managers, architects, and engineers.

Multimedia Update

In your recent Test Lab of multimedia upgrade kits, you stated that the Pro AudioSpectrum 16 did not have MPU-401 compatibility. That was true at the time the piece was written, but since then, this compatibility has been added to the board.

CLAIRE MERRIAM MEDIA VISION FREMONT, CA

Border Guard

I want to print out a text file by typing copy filename prn, but my printer prints right through the perforations. Is there any way to control the length of page when copying a file to PRN? ABIGAIL FURTH

KANSAS CITY, MO

There's no way to control the Copy command, but here's a simple BASIC program that intelligently breaks a file into lines and prints them. When you run the program, it will ask for the name of the file to print. You can enter the complete path at this prompt. The third line sets the width of the printed page. The fourth line sets the length of the page in lines.

INPUT "File to type"; a\$ OPEN a\$ FOR INPUT AS #1 linelength = 50 pagelength = 20

WHILE (i < linelength) AND NOT (EOF(1)) a\$ = INPUT\$(1, #1) b\$ = b\$ + a\$i = i + 1WEND

WHILE LEFT\$(b\$, 1) = "" i = i - 1b\$ = RIGHT\$(b\$, i)WEND FOR k = 1 TO i a\$ = MID\$(b\$, k, 1) IF a\$ = CHR\$(13) THEN MID\$(b\$, k, 1) = "" i = k**GOTO** printer END IF NEXT

WHILE (i > 0) AND (a\$ <> "") a\$ = MID\$(b\$, i, 1)i = i - 1WEND printer: IF (i = 0) OR (i = linelength) THEN LPRINT b\$ b\$ = "" i = 0

ELSE a\$ = LEFT\$(b\$, i) LPRINT a\$ i = (linelength - 1 - i)b\$ = RIGHT\$(b\$, i) END IF i = i + 1

IF j > pagelength THEN j = 0: LPRINT CHR\$(12) IF NOT EOF(1) THEN GOTO top **CLOSE 1 END**

File Opener

I have several data files on a floppy disk. What coding can I use to open different files from the same GW-BASIC program? ARNOLD MOSS BRONX, NY

You saw the technique in the previous program. The components of the file-opening command are Open, followed by the name of the file, followed by the use you intend to make of the file (Input or Output in GW-BASIC), followed by the

number of the file. For example, the following little piece of code opens the files called AU-TOEXEC.BAT and CON-FIG.SYS for input as #1 and #2 and SYSTEM.FIL for output as #3. It uses a variable in place of the filenames to show how this is done. If you prefer to specify the file to be opened. just place its name in quotation marks where you see FILE-NAME\$ in the example. If you're using a different BASIC. leave off the line numbers.

1 READ FILENAMES 2 OPEN FILENAME\$ FOR INPUT AS #1 3 READ FILENAME\$

4 OPEN FILENAMES FOR INPUT AS #2

5 READ FILENAMES

6 OPEN FILENAMES FOR OUTPUT AS #3

7 WHILE NOT EOF(1) 8 LINE INPUT #1, a\$

9 REM Note that you access the

10 REM file by its number (#1)

11 REM rather than its name.

12 PRINT #3, a\$

13 WEND

14 WHILE NOT EOF(2)

15 LINE INPUT #2, a\$

16 PRINT #3, a\$ 17 WEND

18 CLOSE

19 REM CLOSE with no arguments 20 REM closes all open files.

21 END

22 DATA "C:\AUTOEXEC.BAT", "C:\CONFIG.SYS".

"C:\SYSTEM.FIL"

If you're really interested in BAprogramming, should move up to a higherpowered BASIC, such as QuickBASIC, True BASIC, or PowerBASIC.

None of Your BBS

What, exactly, is a BBS? A few months ago, you had an article about how to start one, but you never said what it was.

BILL FINGER CHAMPAIGN-URBANA, IL

Passing over perfs.

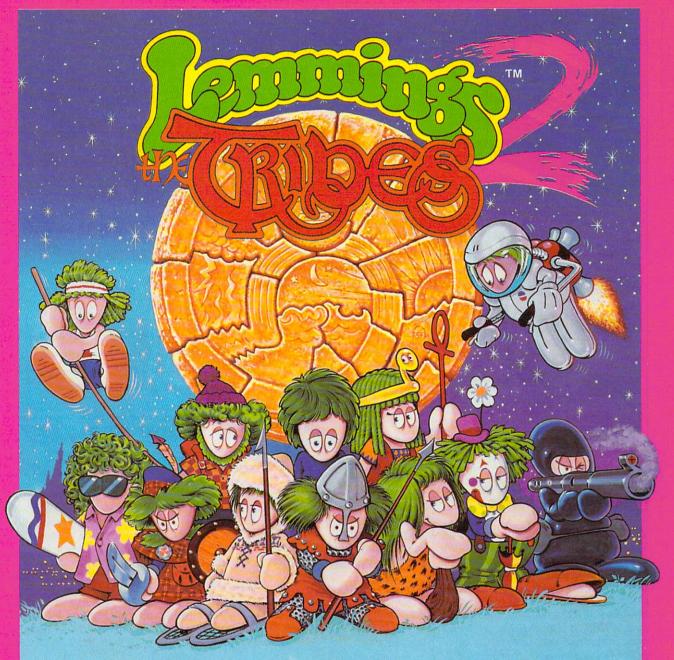
turning SMARTDrive

adding up errors,

defining a BBS,

on and off.

and more



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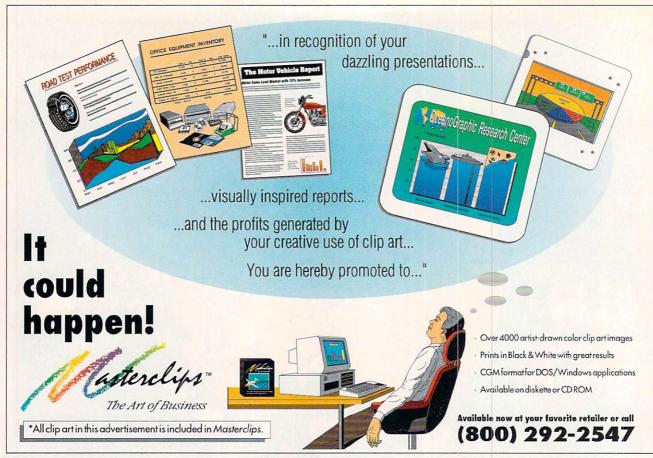


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FEEDBACK

We received a few letters about this. BBS stands for Bulletin Board System. A BBS is a computer system that you can call using your computer and modem. The BBS might have shareware programs, special-interest groups, and data files of interest to you. CompuServe is a BBS, but most BBSs are small, noncommercial services run by computer hobbyists who charge little or nothing.

The term has been in wide use for so long that it didn't seem necessary to spell it out. Thanks for pointing out the error of our ways.

SMARTERDrive

In Clifton Karnes's "Productivity Choice" review in the October 1992 issue, he mentions that SMARTDrive can be turned on or off. How do I disable SMARTDrive?

DAN E. QUACKENBUSH PORT HADLOCK, WA

Assuming that you're using Windows 3.1, you'll find that SMARTDrive is now an EXE file instead of a SYS file. That makes it a lot more accessible.

To see all that you can do with

SMARTDrive, type its filename followed by the /h parameter, as in smartdrv /h. (Most DOS 5.0 commands will give you help if you type the command followed by /? or /h.) That will display a menu of options including + and -.

These options turn the caching on or off for a given drive. To turn the caching on for your C drive, type smartdry c+, and to turn it off, type smartdry c-.

The Other 560K

I've just purchased a new 3½-inch double-sided, high-density disk. The box is labeled 2MB, which I take to mean that the disk can store 2MB. The problem is that my PC will only format to 1.44MB. How can I format the disk to its full capacity?

MIKE PERRY CENTREVILLE, VA

You can't format it to its full capacity. Or rather, you already have. A large portion of the information on any disk is invisible to you. The 2MB referred to on the box is its unformatted capacity. The formatted capacity of a 2MB floppy is 1.44MB. Adding to the confusion, the new 2.8MB ED floppies have 4MB unformatted capacity.

Grandmaster

I'm writing in response to your article "Check and Mate" about chess games. Grandmaster Chess, which wasn't mentioned in the article, is guaranteed to beat Chessmaster 3000 as well as Sargon V and has also defeated Zarkov in head-to-head play. Grandmaster Chess features Super VGA graphics and digitized voices for only \$59.95. As reflected in its name, we offer the Grand Master of chess programs.

JAMES WHEELER INTRACORP MIAMI, FL

Double, Double

Try out the following little program.

FOR i% = 0 TO 22 IF i% * i% <> i%^2 THEN PRINT i% NEXT

Most of the values between 0 and 22 will show a different result from these supposedly identical commands. The same thing happens in QBASIC and QuickBASIC.

What's going on?
PETER MILNES
PIERREFONDS, PQ

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Since QBASIC and QuickBASIC use the same interpreter, it isn't surprising that they yield the same result. The differences are caused by rounding errors.

Before any value can be worked on by your computer, it must be converted into binary numbers. The operation is then performed on the binary numbers. Finally, the binary values are converted back into decimal numbers. The conversion process usually involves some loss that shows up in most BASICs in one operation or another. This loss is called rounding error.

Despite the discrepancies that your program illustrates, the difference between the values isn't very significant. Try this change to your program to see how large the difference between the sauares is.

FOR i% = 0 TO 22 IF i%*i% <> i%^2 THEN PRINT i%, i%*i%-i%^2 NEXT

Note that the numbers are accurate to 17 to 18 decimal places—between a hundredth of a quadrillionth and a quintillionth.

To put this into perspective, a quintillion miles is equal to about 1.5 billion light years (or about a tenth the width of the known universe). There are about 150 quadrillion microns between the sun and the earth and about 1.5 quintillion microns between the sun and Saturn.

The good news is that the rounding error is very easy to deal with. If you assign the value to a variable, for example, it's truncated to its

Although we weren't able to get a statement from Microsoft to this effect, we suspect that the powers function (^) actually uses logarithms. You will generate similar errors if, instead of raising to a power, you simply add the logs of the numbers as in the following.

PRINT EXP(LOG(x%) +LOG(x%))

Do you have a question about hardware or software? Or have you discovered something that could help other PC users? If so, we want to hear from you. Write to COMPUTE's Feedback, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. We regret that we cannot provide personal replies to technical questions. Letters submitted to "Feedback" become the property of General Media International.

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WITH A LITTLE HELP
FROM OUR RESIDENT
EXPERT, YOU CAN
MAKE WINDOWS RUN
LIKE A CHAMP.

BY WILLIAM HARREL

No doubt about it, Windows takes the doldrums out of PC computing. We no longer must stare at the boring, unforgiving DOS prompt. It's easier and more fun to launch and manage applications, and the impact of our work is enhanced by Windows' ability to display millions of colors and play sound. Even computer games are more exhilarating. However, on its own, Windows is still somewhat cranky and unexciting. If not configured properly, it can be excruciatingly slow. And you can't really get the full potential of many Windows applications without additional hardware.

Computer users (especially Windows enthusiasts) are on a constant quest to get more performance from their machines. To help you, here are ten fairly inexpensive ways to soup up Windows, making it run faster and making the ride more interesting. So, reach beyond the ordinary and give Windows some pizzaz.

Improving Performance

Because of the huge amounts of code required to run applications in a graphical environment. Windows encounters several bottlenecks while running on your computer. Your CPU spends a lot of time waiting for other parts of the computer. Most often, these clogs occur during hard disk accessing and while displaying data on your monitor. The first five ways you can soup up Windows are methods to speed up your system's performance.

1. Install additional RAM. On a system with only 1MB or 2MB of RAM, a surefire way to speed up Windows is to add more memory to your computer-which, nowadays, is quite inexpensive. On most machines you can add memory for well under \$50 per megabyte if you shop around. While most software for Windows requires only 1MB-2MB RAM to run, many programs benefit greatly from having an additional 2MB-4MB to stretch out in. More of the program code can load into memory, resulting in less disk accessing. When you're working on large documents or graphics, it's faster if all of the file is in RAM. And you can use the extra memory to improve the performance of SmartDrive (the disk cache bundled with Windows) or to install a RAM drive.

2. Optimize Smart-**Drive.** Before Windows 3.1, computer pundits almost unanimously recommended replacing SmartDrive with a thirdparty product. However, the latest version, 4.0, is as fast and proficient as most of the others. What SmartDrive does is to reserve a portion of system RAM as a temporary storage bank. When you execute a command from the hard disk, depending on the size of the cache, SmartDrive scoops up and loads not only the code needed to execute the command but also blocks of code on either side of the command. The theory is that the computer will probably soon be called on to use the surrounding code as well. And you'd be surprised how often the theory proves true. So, up to a certain point, the larger the cache, the less often your system has to call to the hard disk—your computer's slowest component—for information, thus causing your system to run faster.

When you installed Windows, SmartDrive was also installed to load from your AUTOEXEC.BAT file, one of the files DOS reads while the computer boots. SmartDrive configures itself according to available system memory. It also has the ability to make itself smaller when Windows is running, to provide more memory for your Windows applications. The default settings are shown below.

If you add more RAM to your system or you don't run a lot of programs simultaneously, you can cut down how much you access your hard disk by

DEFAULT SETTINGS		
System RAM	Size in DOS	Size in Windows
1MB and less 1MB-2MB 2MB-4MB 4MB-6MB	All extended RAM 1MB 1MB 2MB	No cache 256K 512K 1MB

hard disk by changing the size of your cache. Do so by editing AUTO-EXEC.BAT in a text editor or in Windows' SysEdit. To set the cache to 1MB while using either DOS or Windows, for example, the SmartDrive entry should read C:\WINDOWS-\SMARTDRV.EXE /e 1024 1024. In this example, SmartDrive loads into extended memory (/e) and is 1MB in size while in DOS and while in Windows. Keep in mind, though, that a cache bigger than 2MB does little good and in some cases can slow down your computer.

There are many other configuration options to enhance SmartDrive's performance. To get a list of them, type smartdrv /? at the DOS prompt. There is additional information on SmartDrive in chapter 14 of your Microsoft Windows User's Guide.

3. Install a RAM drive. If your computer has more than 4MB RAM, you can further reduce disk accessing by using part of the memory as a RAM drive. A RAM drive is a portion of system memory that DOS sets aside and treats as an additional fixed disk. Windows and many Windows applications create temporary files on your hard disk as you work. You can tell DOS to save temporary files to the RAM drive, which allows Windows to save and access the temporary files faster.

Use RAMDRIVE.SYS, which should be located in either your Windows or DOS subdirectory (or both), to create a RAM drive. Using a text editor or Windows' SysEdit, include the following line in the CONFIG.SYS file in the root directory on your hard disk: DEVICE=C:\WINDOWS\RAMDRIVE.SY S 2048 /e. This example creates a 2MB RAM drive in extended memory (use /a for expanded memory). The RAM drive is given the letter of the next drive on your system. If, for example, you have just one hard drive, drive C, the RAM drive will be drive D.

Now you need to tell DOS to use the RAM drive for temporary files. Do so by adding the following line to your AUTOEXEC.BAT file: SET TEMP=D: (or your RAM drive letter, if different). Note that if there is already a SET TEMP= statement in your AUTOEXEC.BAT, you need to be sure to delete it.

4. Install a graphics accelerator. Windows' graphics environment is both pretty and easy to work with, but it demands a lot of your computer to display all those windows, scroll bars, and icons on your monitor. If you spend too much time waiting for screen redraws, you can really supercharge Windows by adding a graphics accelerator, such as Diamond Computer Systems' SpeedStar 24X. Depending on your needs, graphics accelerators range from a few hundred to several thousand dollars-with the price usually determined by how many colors are available at which resolutions and the amount of RAM on the boards.

Graphics accelerators speed up your system by taking the actual processing of the graphics data (which, when displaying 16.7 million colors at 1024 ¥ 780 resolution, is substantial) from the CPU. This allows your computer's processor to work on other tasks, such as calculating a spread-sheet or doing a mail merge.

5. Install a data compression utility. If Windows and its applications are nothing else, they are disk hogs. Depending on your system and how you configure Windows, the environment itself can eat up the better part of 10MB. And many Windows applications require at least 5MB, with several using upward of 20MB. With appetites like that, it doesn't take many programs to devour a 40MB or 60MB fixed disk. Until recently, your only recourse was buying a new hard disk. But now, thanks to data compression utilities such as Stac Electronics' Stacker, Integrated Information Technology's XtraDrive, and Addstor's SuperStor Pro you can inexpensively double the storage capacity of your hard disk.

Data compression software works slightly differently from product to product. Some programs, such as Stacker, create a separate partition for compressed files; others, such as XtraDrive, do not. For slower machines, such as 80286s and slow 80386s, some companies also make compression boards that work with the software to speed up compression. However, if you use a fast 80386 or 80486, data compression software

Adding Sound to Windows Events

Are you tired of Windows beeping at you every time you turn around? After installing your sound card, use this procedure to assign sound clips to Windows' events.

Certain events in Windows-Exclamation, Question, Top, and others—have beeps assigned to them. For example, when you're installing some applications, Windows displays a dialog box and beeps at you each time the setup program calls for another floppy disk. Once you've installed a sound card, you can assign WAV sound clips to this, and other Windows events from Control Panel by using these steps. First, from Program Manager, double-click on the Control Panel icon. Next, in ControlPanel, double-click onSound.

Finally, select the Enable Sound System check box.

Windows is shipped with several WAV sound clips. When you open the Sound dialog box, all the WAV files in your Windows directory are listed in the Files list box. To assign a file to a specific event, select it in the Events list; then select the sound you want assigned to it in the Files list. You can hear the sound by clicking on the Test button. When you close the dialog box, the sound system is activated.

You can copy and delete WAV files from the Windows directory at will, and you can assign an event to any sound you want. For example, when I make a mistake that causes a Critical Stop, a voice admonishes me with an indignant "Wrong!" You can have a lot of fun with sound, especially if you take the plunge and add a microphone.

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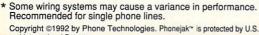
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is sufficient. In most cases, you'll hardly notice the difference between the time it takes for these products to compress and decompress files and the time required for normal operation. And sometimes, such as in loading and decompressing executable program files, the process is actually faster than loading an uncompressed file from the hard disk.

Especially impressive is Stacker 3.0 for Windows and DOS, which allows you to control data compression from inside Windows. The Stackometer gives you up-to-the-second data on compression ratios and disk performance, allowing you to fine-tune Stacker to your machine and application.

Give Windows a New Face

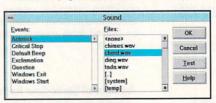
While Windows' Program Manager, File Manager, and outline fonts offer definite advantages over computing in a DOS-only environment, they are by no means perfect. Depending on how you work, there are many options for making Windows (and your documents) better looking and more efficient. Try one or more of the next three options to make launching programs and loading documents easier, to automate tasks, and to improve on the standard-fare fonts (Times and Helvetica equivalents) that ship with Windows.

6. Install a new front end. The Windows application market is loaded with products that replace or enhance Program Manager. Some features that most of them have in common include the ability to launch a group of applications in various application window sizes and positions for performing specific tasks, memory and system resources management, macros, drag-and-drop printing and file loading, a way to change keyboard configurations, and even the option to select functions to assign to the right mouse button. Between shareware and commercial products, there may be as many as 50 of these utilities, and they vary in features and functionality. Five of the most popular are Hewlett-Packard's Dashboard and New Wave, Computer's hDC Power Launcher, Symantec's Norton Desktop

for Windows, and XSoft's Rooms.

All but New Wave let vou decide whether to replace Program Manager or run the utility over it. For example, Dashboard (above) creates a strip that looks like a car dashboard, complete with instrument gauges, that you can place anywhere on your monitor. You can assign often-used programs to the dash for one-click access, and you can create layouts consisting of several applications—such as, say, graphics, DTP, and word processorfor a desktop publishing task. Memory and system resources permitting, you can have up to nine layouts open at one time. And there are, of course, many other features, such as a fuel gauge that constantly displays available memory, one-click printer configuration, and an alarm clock. Dashboard (and Power Launcher) can also be configured to run on top of other windows, even when inactive, so that Windows' shell functions are always just a mouse click away.

Power Launcher offers many of the features of Dashboard and several others as well. You can, for example, reconfigure your keyboard and mouse and even create a separate set of tools for each of your programs. The program even helps take some of the confusion out of Windows' powerful OLE (Object Linking and Embedding) and DDE (Dynamic Data Exchange).



To assign sounds to Windows events, select Sound in the Windows Control Panel.



With a microphone, making recordings in Windows is as easy as clicking an icon.

Rooms uses an office-building metaphor, allowing you to separate tasks into virtual desktops called rooms and suites. Norton Desktop is a group of utilities (such as a file viewer, an automatic backup utility, a scheduler, a data recovery utility, and an icon editor) that you can run from the Norton Desktop shell or from a Norton program group in Program Manager. New Wave, which requires a substantial commitment to install and use. actually changes the way Windows operates by giving your desktop a Macintosh-like feel—tasks separated into folders and a trash can for delet-

ina files.

7. Install a macro utility. One thing Windows sorely lacks is a good macro language. Macros, of course, are small programs containing recorded keystrokes and programming commands that allow you to automate tasks, along the same lines as macros in your word processor. There are enormous benefits to a universal macro language that works across all Windows applications. You can use them to merge data from one program to another, program timed events (such as data transfers in the middle of the night when long-distance rates are lower), and perform countless other tasks. Recorder, the utility currently shipping with Windows, is hardly adequate (hardly worth mentioning, for that matter). Microsoft plans to include a macro language in future Windows releases, but for now we must rely on third-party utilities. Luckily, most of the ones available are quite good.

Some of the shell utilities, such as Norton Desktop, Power Launcher, and New Wave, include macro languages, and they even allow you to play macros from the shell. These are the most efficient and the easiest to use. Two good stand-alone macro products are Publishing Technologies' BatchWorks and AutoSoft's AutoRun. While they have slightly different interfaces, the idea behind them is the same: recording and playing back actions in Windows.

8. Install TrueType fonts. A truly notable addition to Windows 3.1 is the built-in TrueType font rasterizer. (Version 3.0 users should install Type 1 fonts.) TrueType fonts are easy to install and manage, and they print and display faster than fonts used in earlier versions of Windows. However, the program is shipped with only a few TrueType typefaces: Courier, Ariel, and Times New Roman. You can improve the appearance of your drawings, presentations, and documents by installing additional fonts.

TrueType font packages abound. When looking for one, consider collections that contain a variety of strictly business serif and sans-serif fonts, such as Bodini and Universe, as well as a few decorative fonts, such as Cooper Black or Old English. Decorative fonts work well in display ads and fliers. Beware, however: Not all TrueType fonts are created equal. Since the release of Windows 3.1, the market has been deluged with TrueType font collections. For best screen and printer reproduction, choose font collections from reputable type foundries, such as Bitstream and Agfa. Two good collections are AgfaType Desktop Styles and Microsoft's TrueType Font Pack for Windows.

If you're reluctant to switch to TrueType because you already have an extensive Type 1 collection, consider a font conversion utility, such as FontMonger from Ares or AllType from Atech. These programs handily convert Type 1, Type 3, and other formats to TrueType outlines, as well as vice versa—TrueType to other formats. FontMonger also lets you create your own font sets from EPS drawings, and you can even alter existing fonts to create your own unique collections. Or you can create a font made up of logos and symbols you use often.

Listen to Windows

The final two ways you can optimize Windows boost its multimedia capabilities. Perhaps frilly accessories to some, these improvements can enhance your enjoyment and thus your productivity.

9. Add a sound board. To take full advantage of Windows' multimedia capabilities, you should install a sound board. Once a niche market, PC sound is catching on like wildfire. Leading software vendors, such as Microsoft and Lotus, have released multimedia versions of some of their more popular products. Word for Windows & Bookshelf, for example, integrates WinWord with Microsoft's multimedia reference library, Bookshelf. Bookshelf's encyclopedia

Where to Buy

Call the manufacturers listed for the latest pricing information. Many have great deals on upgrades and bundled packages.

AgfaType Desktop Styles— \$79.00 (for 39 TrueType fonts) Agfa (800) 424-897

FontMonger for Windows— \$149.95

Ares Software (800) 783-2737

AllType—\$59.95 (converts to and from Type 1, Type 3, TrueType, Intellifont, and Nimbus-Q)
Atech Software
(800) 786-3668

AutoRun—\$119.00 AutoSoft (404) 594-8855

Viva Maestro Pro 16—\$229.00 Computer Peripherals

(800) 854-7600 (805) 499-5751

Sound Blaster Pro-\$229.95

Creative Labs (800) 998-5227

SpeedStar 24X—\$249.00 Diamond Computer Systems (408) 736-2000

hDC Power Launcher—\$99.95 hDC Computer (206) 885-5550 Dashboard—\$49.00

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(800) 554-1305

XtraDrive—\$99.00 Integrated Information Technology (800) 832-0770

Pro AudioSpectrum 16—\$299.00 Media Vision (800) 845-5870

TrueType Font Pack for Windows—\$69.95 Microsoft (800) 426-9400

BatchWorks—\$99.95 Publishing Technologies (800) 533-1744

SuperStor Pro Addstor (800) 732-3133

Stacker 3.0 for Windows and DOS—\$149.00 Stac Electronics (619) 431-7474

Norton Desktop for Windows— \$179.00 Symantec (800) 441-7234

Rooms—\$99.00 XSoft (800) 626-6775

contains numerous narrated animations that demonstrate processes such as solar eclipses, continental drift, and others. Not only does the dictionary provide a word's spelling and definition, but it also pronounces it for you. The multimedia version of Lotus 1-2-3 has a complete automated help system that provides narrated examples of spreadsheet procedures. And a number of inexpensive presentation software packages—Asymetrix's MediaBlitz and Macromedia's Action!, to name two—allow you to create your own multimedia shows.

When buying a sound board, make sure that it meets Microsoft's MPC

standards, and, if you want the best quality, make sure that it's a 16-bit card. It should also have jacks for CD-ROM output and a microphone. Creative Labs' Sound Blaster Pro is one of the most popular and least expensive; however, Computer Peripherals' Viva Maestro Pro 16 and Media Vision's Pro AudioSpectrum 16 are also quite good.

If you want to talk back to your computer, look for Computer Peripherals' Viva Maestro Pro 16VR voice recognition system, which should be released before you read this. This board comes complete with a headset and allows you to control

your computer with voice commands such as "open," "cut," "paste," and so on. According to Computer Peripherals, you can train it to execute any commands your applications normally perform.

To hear the sound produced by your sound card, you'll also need speakers. Labtec makes several good pairs, ranging from \$20 to \$100. When buying speakers for your PC, make sure that they're shielded so that their magnets won't damage your monitor. And, since sound boards don't crank out a lot of wattage, your new speakers should also be self-amplified.

10. Add a microphone. Perhaps one of the least expensive ways to have fun with Windows-and enhance your multimedia prowessis to install a microphone. Unlike almost everything else on your computer, this is the one peripheral that doesn't require its own card and software. The jack is built into your sound card, and Windows' Sound Recorder utility is waiting, ready to capture your voice and whatever else you want to record.

Installing a microphone is almost too easy. You can get one at the neighborhood Radio Shack or other electronics stores for a little over \$10.

Why TrueType Prints Faster Than ATM

Does TrueType print faster than the leading Type 1 font rasterizer, Adobe Type Manager (ATM)? The answer is yes, but not always noticeably so. When using TrueType fonts, Windows enhances printing speed by reducing the amount of data that's downloaded to the printer.

On LaserJets and compatible printers, TrueType speeds performance by streamlining the font information downloaded during printing.

Instead of sending an entire page in the form of a huge bitmap as with ATM, Windows sends only the characters needed to print the document when using TrueType. New characters are not sent until they're encountered in the document. Unused characters are not sent at all. Since individual characters are

downloaded rather than entire font files, no time is

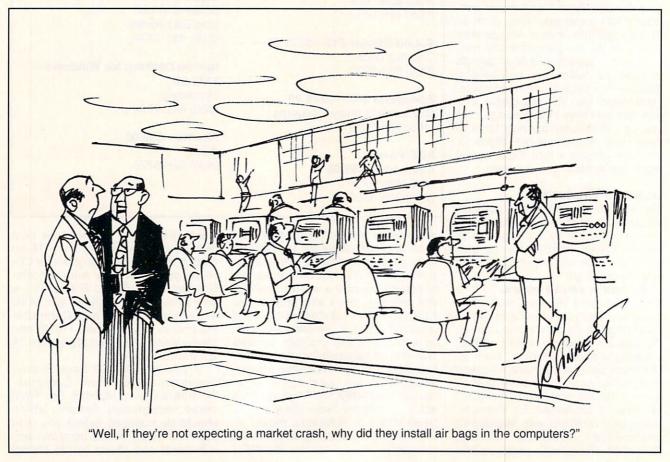
wasted sending and processing unnecessary data.

On PostScript printers, imagesetters, and slide recorders, the same process (downloading only necessary characters) is used, as well as yet another optimizing technique. Smaller point sizes (14 points and smaller on 300-dpi laser printers) are downloaded as bitmaps, rather than as outlines. The bitmap files (Type 3 fonts) are smaller and therefore don't take as long to download.

When you're printing short documents, such as letters and memos, the speed gained from this process is hardly noticeable. But TrueType can really speed printing of long documents or those that contain a lot of different fonts at various point sizes. The longer your document, the more time you save.

If you plan to do high-end multimedia presentations, you'll want a better microphone, but for most home and small business uses, the inexpensive ones are fine. I use an \$11 Realistic microphone with my system. There

are, of course, hundreds of other ways to soup up Windows, and the technology is changing all the time. I'm looking forward to the day when my computer will load and unload the dishwasher and feed my fish.



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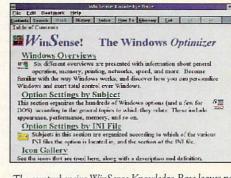
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T use DOS games	My network has net kins	
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NetWark	I use a local printer	
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TWO KEYBOARD MAGIC TRICKS

Windows is a mouse-driven environment, and much of its power and ease of use comes from the mouse. But don't sell the Windows keyboard short. When it comes to speed, you simply can't beat keyboard commands, especially if your hands are on the keyboard already. As you probably know, Windows has a fair number of keyboard shortcuts built in, but there's plenty of room for more, and that's this column's topic.

First, much of Windows' interface is standard across applications. Most windows have a title bar, menu bar, and scroll bars (if they're needed), and the windows themselves can be moved and resized. You'll also note that almost every menu bar includes entries for File and Help. Digging deeper, if you examine almost any File menu, you'll see entries for New, Open, Close, Save, Print, and Exit. This structure is all part of Windows' standard interface, and it's one of the reasons that Windows is so easy to use—the parts of different applications that work the same way have the same menu choices.

If you look at the keyboard shortcuts in several different File menus, however, you'll see a variety of key combinations. The Save command, for example, may be Shift-F12 in one application, F2 in another, Ctrl-S in a third, and many programs will have no shortcut key at all. Unlike menu options, shortcut keys are not standard.

You can change all that, however, with Windows' Recorder.

Let's say that you want Shift-F12 to save the current file in all your Windows applications. I use Shift-F12 because it's the

shortcut in Word for Windows and I've grown accustomed to it, but you can substitute any key combination you'd like.

To get started, run any Windows program that can save files, and fire up Recorder. To make sure Recorder is not recording mouse movements, go into Options, Preferences and select Ignore Mouse. Next, name your macro Save (or something similar) and choose Shift-F12 for the key combination. Now, choose Macro, Record and press Alt-F, S in your application. Alt-F activates the file menu, and S selects the Save command. Stop recording and, under Options, Properties, select Playback to Any Application. Now, Shift-F12 will save the current file in any Windows program that follows the minimum Windows standards.

You can probably think of other Windows shortcut keys that might be worth implementing. Open, Save All, and Close are possibilities.

The second keyboard shortcut I'm going to discuss involves running DOS under Windows. One of Windows' most famous shortcut keys is Alt-F4, which closes the active window. This is a quick way to exit any Windows app. Unfortunately, it won't work in a fullscreen DOS session under Windows nor in a DOS box under Windows. With a little help from ANSI.SYS, however, we can create an Alt-F4 macro that will close a DOS window.

What our macro will do is simply map the strings for Ctrl-C (to end any running tasks) and the Exit command (followed by a carriage return) to the Alt-F4 key combination. It might be dawning on you that this macro will only work at the DOS prompt or when a program that Ctrl-C can exit from is running. That's true, but those instances will probably cover most of the times you

need a quick DOS exit.

OK. The first thing you need to do is put ANSI.SYS in your CONFIG.SYS file, if it isn't already installed. Use the line DEVICE=ANSI.SYS or DEVICEHIGH=ANSI.SYS.

Next, we need to create an ANSI.SYS macro file that's going to look like this.

← [0;107;3;"EXIT";13p

Here's a rundown on what this bizarre-looking string does. The ← is the escape character. The [starts the macro. The number 107 is the Alt-F4 macro shortcut key. The number 3 represents Ctrl-C. "Exit" is, of course, Exit, and 13 is the number for a carriage return.

To create this macro, run the DOS Edit command (found in DOS 5.0 or higher) or run any editor that will let you embed an escape code in a file. To enter the escape character in DOS Edit, first press Ctrl-P, then Esc. Then, enter the remaining characters exactly as shown above and save the file.

To install this macro, you simply type it at the DOS prompt. For example, if you named this file ALT-F4.TXT, you install the macro with the following command.

type alt-f4.txt

The easiest way to use this macro is to put the line above in your AUTOEXEC.BAT file. If ANSI.SYS is installed, and this macro is installed before you run Windows, the Alt-F4 key combination will be available in any DOS session run under Windows.

To test this macro, exit Windows (if Windows is running), type *alt-f4.txt* at the DOS prompt, and rerun Windows.

Now, run DOS Prompt, either in a window or full screen; when you press Alt-F4, you'll exit—fast.

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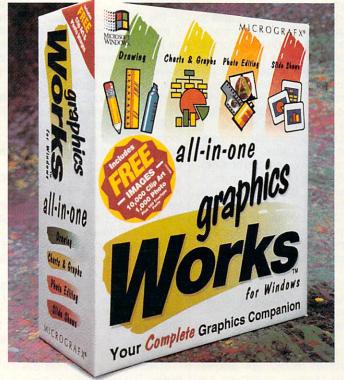
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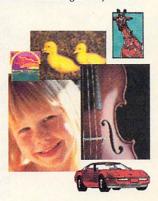
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OPEN UP YOUR WORLD

If you've ever wondered how to open up your programs to data from the outside world, the 1-2-3 worksheet format probably came to mind. It's easy to use, especially if you stick to the basics—labels, numbers, dates, and so on—because it was made public in the product's first release.

Later formats weren't made public by Lotus, but everything that you need is on CompuServe's LOTUSA forum, library 9, under the name WSFF.ARC.

The worksheet format, elegantly simple and extensible, is made of variable-length records as follows:

Bytes 1–2: Record type Bytes 2–3: Length of record body Bytes 4–n: Record body

In the two-byte quantities (such as record type and record length), numbers are stored in the standard Intel fashion: the first byte is the remainder when the number is divided by 256; the second byte is the quotient. These twobyte values are often called words. The first byte is called the least significant byte (LSB), is the lower part of the word, and is stored first. The second byte is called the most significant byte (MSB). As we'll see later, sometimes the length word will be 0, and there will not be a record

A worksheet file is made up of at least two records: the BOF (Beginning Of File) and EOF (End Of File). The BOF also serves as a version indicator; it's different among WKS, WK1, and WK3 files. For our purposes, the original WKS file will be fine, as any program that imports worksheets

supports it. Since information on the newer WK1 and WK3 formats wasn't made public, applications are less likely to read them.

The BOF record contains a O for each of the type bytes, so the BOF record type number is 0. The next two bytes represent the length word, which tells how long the rest of the record will be (it does not count the type or length words). The BOF record is only two bytes long: the 2 in the length word comes first and is stored in the LSB: the MSB contains 0. For a WKS file 04 04, the body of the BOF record contains the version bytes BOFRecord: DA-TA 0, 0, 2, 0, 04, 04.

The EOF doesn't need any version info; it consists solely of the type word—who has a value of 1 and is stored as a byte value of 1 followed by a 0 byte for the MSB—and a length word, whose value is 0. These two items make the minimum legal WKS file, EOF-Record: DATA 1, 0, 0, 0.

A label is sandwiched between. The WriteLabel subroutine lets you pass any text, along with row and column info. It automatically creates a label at the specified row and column. Cell A1's row value is 0 and column value is 0; B2 would be 1,1; D4 would be 2,3; and so on.

Download WSFF.ARC for the numeric format. The listing that follows here begins with labels because they can be converted to numbers once they're in the program.

' Create a Lotus wks file with labels in it using QuickBASIC. DECLARE SUB WriteLabel (Label\$, LRow!, LCol!, Handle!) Filename\$ = "test.wks" Handle = FREEFILE OPEN Filename\$ FOR OUTPUT AS Handle

RESTORE BOFRecord FOR Index = 1 TO 6 READ NextVal PRINT #Handle, CHR\$(NextVal); NEXT Index

WriteLabel "This is cell A1", 0, 0, Handle
WriteLabel "This is cell C2", 2, 1, Handle

WriteLabel "This is cell D4", 2, 3, Handle

RESTORE EOFRecord
FOR Index = 1 TO 4
READ NextVal
PRINT #Handle, CHR\$(NextVal);
NEXT Index

CLOSE Handle

BOFRecord: DATA 0, 0, 2, 0, 04, 04

EOFRecord: DATA 1, 0, 0, 0

SUB WriteLabel (Label\$, LCol, LRow, Handle) '15 is the record type.

'15 is the record type.
PRINT #Handle, CHR\$(15);
CHR\$(0);

' Write the length of the ' string, plus 6 for the format,

' column, row, and prefix. The ex-

' 1 is for the 0 byte that ends ' the label.

PRINT #Handle, CHR\$(LEN(Label\$) + 7);

' End the label with a 0 byte. PRINT #Handle, CHR\$(0);

' The format byte. PRINT #Handle, CHR\$(245);

' The row.

PRINT #Handle, CHR\$(LRow MOD 256);

PRINT #Handle, CHR\$(LRow \ 256):

' The column.

PRINT #Handle, CHR\$(LCol MOD 256);

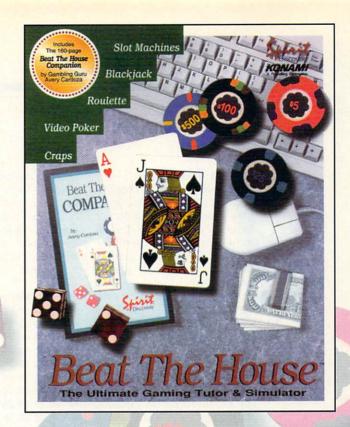
PRINT #Handle, CHR\$(LCol \ 256);

PRINT #Handle, CHR\$(39); FOR i = 1 TO LEN(Label\$) PRINT #Handle, MID\$(Label\$, i,

1); NEXT i PRINT #Handle, CHR\$(0); END SUB

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TIPS & TOOLS

Edited by Richard C. Leinecker

Send In Your Tips

Except for one, this month's tips were all written by yours truly. I ran out of those terrific letters I've become accustomed to. I'd like to thank those of you who've submitted tips, though. If you've been thinking about sending something in, there's no time like the present.

A large number of you have sent in Debug scripts that sound great, but I can't use them unless you also send in the source code. It wouldn't be a wise practice to run programs blindly because they might have the latest virus or a hard drive format routine. If you've sent in a Debug script without source code. please resubmit the tip and include the source code.

RICHARD C. LEINECKER MIAMI, FL

Soup Up Your Keyboard

Here are two utilities that let you customize your keyboard links. One program adds a click when you press a key, and the other lets you take advantage of the larger keyboard buffer size by stuffing it with text strings.

debug keyclick.com File not found

-e 100 b8 09 35 cd 21 89 1e 4c -e 108 01 8c 06 4e 01 b8 09 25 -e 110 ba 1c 01 cd 21 b4 31 ba -e 118 20 00 cd 21 50 51 e4 60 -e 120 a8 80 75 1f 3c 1d 74 1b -e 128 3c 38 74 17 3c 36 74 13 -e 130 3c 2a 74 0f e4 61 34 02 -e 138 e6 61 b9 88 13 e2 fe 34 -e 140 02 e6 61 59 58 9c 2e ff -e 148 1e 4c 01 cf -RCX CX 0000 :4c -W Writing 004c bytes

If you run Checksum (July 1992 "Tips & Tools") on this program, the number 035 | Then, every time you call up a

should appear on your screen. To run the program, just type keyclick at the command line. It'll stay memory resident and keep clicking until you reboot your system. It takes up 912 bytes of conventional RAM.

debug stuffkey.com File not found

-e 100 2b c0 8e c0 be 80 00 ac -e 108 0a c0 74 41 ac 3c 0d 74 -e 110 3c 3c 20 74 f7 4e 26 8b -e 118 0e 80 04 26 8b 16 82 04 -e 120 ac 3c 0d 74 28 26 8b 3e -e 128 1c 04 3c 7e 75 02 b0 0d -e 130 2a e4 26 89 85 00 04 47 -e 138 47 3b fa 7c 02 8b f9 26 -e 140 3b 3e 1a 04 74 05 26 89 -e 148 3e 1c 04 eb d3 b4 4c cd -e 150 21 -RCX CX 0000 :51 Writing 0051 bytes

If you run Checksum on this program, the number 119 will appear on your screen.

Just type stuffkey "test string to stuff" to run the program. If you want a carriage return, use the tilde symbol. RICHARD C. LEINECKER MIAMI, FL

DOS Command Line Tips

DOS 5.0 has given us plenty of switches to customize the way directories are displayed, but it's tedious to type those command line switches every time you call up a directory. There's a special DOS 5.0 environment variable named DIRCMD. You can use it to set the default switches for vour directories.

If you want to use the /od and /I switches, just add a line to your AUTOEXEC.BAT file as follows.

set dircmd=/od /l

directory, it'll be sorted by date and displayed with lowercase characters.

You might get tired of typing in a volume name at the prompt when you format disks. You can preset the volume name with a command line switch. If you want to name the disk MYDISK, type format a: /v:mydisk. If the volume name will have spaces in it, you'll have to use quotation marks, as in format a: / v:"mydisk ii".

You can clean a disk of files and subdirectories easily by formatting with the /q switch. Technically, the disk won't actually be formatted, but you will clear the file allocation table and directories. Therefore, you can only use this option on a disk that's already been formatted. Still, that's a whole lot easier than deleting a bunch of embedded subdirectories. Just type format a: /q.

Do you get impatient with Format when DOS tries to see if there's any information on the disk to preserve so that it can be unformatted? I've never formatted a floppy disk by mistake, only to find that I needed to recover files from it. When I type format, I want it done. To avoid the long delay while DOS inspects your disk, all you have to do is add a /u command line switch. To format a disk unconditionally, you would type format a: /u.

RICHARD C. LEINECKER MIAMI, FL

Batch File Tips

Many programming languages have a switch statement that makes program organization much easier. The batch file language doesn't have that, but the For statement can act as a kind of switch statement. It's really handy for jumping to a part of the batch file according to a com-

Keyboard magic with tiny TSRs and feeding parameters to DOS commands automatically

Here's How To

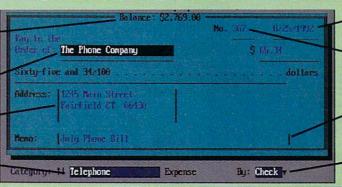
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TIPS & TOOLS

mand line argument. Here's an example.

FOR %%P IN (XY xy WIN win

WP wp) DO IF "%1"=="%" P" **GOTO %1** ECHO Invalid parameter given or no parameter given ECHO Correct inputs are XY, WIN, or WP **GOTO END** :XY **ECHO Run XyWrite EDITOR GOTO END** :WIN **ECHO Run Windows** WIN **GOTO END** ·WP **ECHO Run WordPerfect WP51** :END

Coping with mixedcase arguments in batch files and touching your files from DOS

If one of the parameters you're looking for is an argument, the batch file will branch to the correct label. This works because Goto isn't case sensitive. It doesn't handle instances of mixed case like Wp or Xy.

You can also use the same trick with returned error levels. Note that for this technique the values must be in ascending order.

If you have a utility that runs and returns an error level, then you can scan for a match with a batch file routine like this.

FOR %%E IN (0 1 2 3) DO IF **ERRORLEVEL %%E GOTO** CASE%%E ECHO Correct value not found **GOTO END** :CASEO ECHO Do the stuff here that's the choice for 0 **GOTO END** :CASE1 ECHO Do the stuff here that's the choice for 1 **GOTO END** :CASE2 ECHO Do the stuff here that's the choice for 2

GOTO END :CASE3 ECHO Do the stuff here that's the choice for 3 **GOTO END**

One of the biggest pains when taking arguments for batch files is the case sensitivity. It's not that hard to have a lowercase and an uppercase comparison, but what if users mix cases? Here's an example of how your batch file can run into trouble.

IF "%1"=="COMPUTE" GOTO COMPUTEMAG IF "%1"=="compute" GOTO COMPUTEMAG

If you type COMPUTE or compute, you're OK. But if you type Compute or COMpute, your logic fails.

There's a way to fix this with a trick. It takes advantage of the fact that DOS always capitalizes environment variables created with the Set command.

ECHO OFF IF "%1"==" GOTO END SET %1=\$\$ IF "%COMPUTE%"=="\$" GOTO COMPUTEMAG **ECHO Not COMPUTE Magazine GOTO END** :COMPUTEMAG **ECHO Yes COMPUTE Magazine** :FND SET COMPUTE=

What happens is that the statement SET %1=\$\$ creates an environment string called COMPUTE and sets it equal to a string of \$\$. Then, the "%COMcomparison IF PUTE%"=="\$\$" is true if COM-PUTE is the argument. RICHARD C. LEINECKER MIAMI, FL

Touching Tale

I have a utility that came with Turbo Pascal called Touch. It updates file dates and times without my having to load the files into an editor and resave them. That's important when I compile, but it can also be important for doing backups.

You don't need a special program, though; with DOS you can do pretty much the same thing. Here's a line that shows you how.

COPY /b filename +...

If you wanted to update the time and date of a file called MYSTORY.TXT, you'd type copy /b mystory.txt + ...

A batch file makes touching files in DOS a lot easier. Here's one I created and called TOUCHIT.BAT. Remember never to use wildcards with this batch file.

ECHO OFF IF "%1"=="" GOTO MIS IF "%1"=="/h" GOTO MIS IF "%1"=="/?" GOTO MIS COPY /b %1 +... **GOTO END**

:MIS ECHO This program updates files'

ECHO times and dates without ECHO loading them into memory. ECHO The format for this

ECHO command is ECHO TOUCHIT filename

ECHO where filename must be ECHO the name of a file. You ECHO cannot use a mask

ECHO (no wildcards). :END THOMAS E. HINES III

KANSAS CITY, MO

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HARDWARE CLINIC

Mark Minasi

INTERRUPTS MADE EASY, PART 2

Last month, we started looking into what interrupts are and why they're important. This month, we'll look more closely at interrupts.

For those just joining us, I explained last month that an interrupt is a means whereby an input/output device on a PC gets the attention of the PC's CPU so that the input/output device can direct the CPU to move some data around.

For example, the keyboard controller on your PC must get the attention of the CPU every time you press a key on your keyboard. It has to do that because the keyboard controller has only enough storage to hold onto one keystroke. If the CPU doesn't handle the keystroke in the controller quickly, it may become overwritten by a newer keystroke, losing the original keystroke forever. I explained that on some systems the keyboard controller can't force the CPU to pay attention to it; instead, it must wait for the CPU to periodically ask the keyboard controller if the controller has a keystroke. Such a process, where the CPU checks the controller regularly, is called polling, and it's used in lieu of interrupts in some applications.

I then discussed how the interrupt on the printer port greatly affects whether or not your system can print under Windows and OS/2. Additionally, I explained that putting more than one device on the same interrupt will generally cause both devices to fail.

This month, we'll pick up where we left off, with a discussion of how you can avoid those interrupt conflicts. That'll lead to a discussion of interrupt priorities.

Suppose that you're going to insert a new circuit board in your PC; let's say it's a Sound Blaster Pro (SBPro) from Creative Labs. You want to avoid the evils of interrupt conflicts. so what should you do? Not all add-in cards need an interrupt, so there may be nothing to worry about. The first order of business, then, is to check the documentation that came with the board to find out if an interrupt will be needed.

The SBPro is a well-documented board (thanks, Creative), and one of the first items discussed is how to insert the board and test it with the included diagnostic software. The documentation tells you that the SBPro does, indeed, need an interrupt channel (as well as an input/output address range and a Direct Memory Access, or DMA, channel, but that's a discussion for another day). The SBPro is a 16-bit board and, as such, could in theory be designed to use any interrupt between IRQ2 and IRQ15. (Recall that interrupts are called IRQs and that a 16bit card has access to interrupts numbered 2 through 15. IRQ0 and IRQ1 aren't available via the bus slots because they're already used by the timer and the keyboard, respectively.) The SBPro offers the option of using IRQ2, IRQ5, IRQ7, or IRQ10; it comes from the factory set for IRQ7.

Now, it just won't do to leave the interrupt at IRQ7, as that interrupt is reserved, as you learned last month, for LPT1, the primary parallel port. Leaving the SBPro at IRQ7 could cause problems for printing. The worst of it is that the printer port conflict usually won't show up immediately. I often see a message on the online forums that looks something like this: "I'm trying to run Wing Commander II. The opening music comes up, the credits roll, and all looks well. But as soon as one of the characters starts to speak, the system locks up." (I used a Wing Commander example because I play the game, but the same messages show up on other game and nongame forums.) The reason why the opening music is all right but the speech locks up the system is that music is generated differently than speech. Exactly how that all works is a topic for another column-but it's true, believe me. Anyway, the root cause of the lockup is the SBPro conflict. Change the interrupt, and the problem will go away.

How, exactly, do you know which interrupts are already taken in your system and change the interrupt that the SBPro uses? Or more generically, how do you change the interrupt that any board uses?

The first question is actually the tougher one. You'd think that it would be a childishly simple matter to run a program that would tell you which interrupts you're already using. Unfortunately, that's not the case. There are many programs that attempt to detect interrupts, but there's no definitive way to detect interrupts with software.

These programs work either by tracing information in your device drivers or by simply looking up interrupt correspondences. In the first case, they analyze any device drivers or TSRs that you have loaded to see which hardware interrupts they're designed to work with. These interrupts go on the list of already-taken interrupts. In the second case, there are, as I explained last month, standard interrupt settings for the basic hardware that you find in virtually all PCs. If the diagnostic program detects a floppy drive controller in your system, then it knows that IRQ6 is taken, as the floppy controller uses IRQ6 by default. Notice that if you have a nonstandard flop-

How interrupts work, and how to choose the interrupts that will work best for you

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HARDWARE CLINIC

py controller, the diagnostic program won't be accurate.

Now you can see that programs that claim to detect your interrupts for you are at best good guessers and at worst totally wrong. If you must use one of these programs, however, you can increase the probability that it will work correctly by making sure that you load all the device drivers and TSRs that are relevant to your hardware your network drivers, your mouse driver, and so on. Having said that, however, let me reiterate that this isn't the right way to find out which interrupts your system uses. In the particular case of the SBPro, for example, I've found only one program that's capable of detecting its presence on my PC—QAPlus. No other diagnostic program that I've run can locate the SBPro's interrupt. save for the diagnostic program that comes with the SBPro.

This leads me to the right way to figure out which interrupts you're already usingdocumentation that comes with your PC and its add-in boards. Chances are that you have a normal COM1 and COM2 using IRQ4 and IRQ3, respectively; a normal floppy controller using IRQ6; and a normal parallel port using IRQ7. You should avoid using IRQ2 because it's the connection to IRQ8 through IRQ15. You shouldn't use IRQ8 because your system clock uses it. IRQ13 is used by your coprocessor, and IRQ14 is used by the hard disk controller.

So which interrupts are used by the slightly strange boards you may have in your system, such as a local area network board or a scanner interface? The only way to know for sure is to check the documentation that came with the boards. I'll tell you what I do to

keep track of interrupts on my system: I tape a large envelope to the side of my PC. (It's a tower, so there's plenty of space. If your PC isn't in a tower case, you can tape the envelope to the monitor.) I keep an index card in the envelope that tells me which interrupt each board in that system uses.

Before moving on the second question (How do you change the interrupt that the SBPro uses?), let me stress the essential nature of keeping and reading the documentation that comes with the board. I know it's a pain, but there's no substitute for knowing what's in your system, rather than guessing.

The SBPro documentation says that you can choose IRQ2, IRQ5, IRQ7, or IRQ10. IRQ2 should be avoided, and 7 is out; again, it's sad that 7 is the default. IRQ5 would be OK, and so would 10. But I've run into many boards that don't offer any interrupts but the ones in the 2-7 range, so it seems a good policy to use IRQ10 when possible. Let's do that with the SBPro. To actually tell the SBPro to use IRQ10, you have to move a jumper on the board itself. Again, the SBPro is better documented than the average board, and the jumper locations for the various interrupt choices are right on the board. There's a row of pins labeled IRQ2, IRQ5, and so on. Many companies, in contrast, label the pins JP1-1, JP1-2, and the like, requiring you to constantly look at the manual. In this case, you just remove the jumper that's currently across the IRQ7 position and move it to the IRQ10 position.

On some boards, choosing interrupts is even easier. You just run a program (supplied with the board) that essentially sets the jumper with software—no fiddling around with

jumpers is required.

Even though the board is in, you're not done yet. You have to load the driver programs that use the SBPro (or whatever new board you're installing), and you typically must inform those drivers of the interrupt (and possibly the DMA and input/output address) that the board is set to.

Besides the concern about not putting two boards on the same interrupt, does it matter which interrupt you choose for the SBPro? It may, due to the nature of the different interrupts.

Interrupts in the PC world are prioritized. The device on IRQ0 gets the highest priority, and the device on IRQ15 gets the lowest priority. That sounds like a real hidden gem of a piece of information, but it's not all that terribly important. It usually makes sense to put slower devices on the higher-priority interrupts. That's because a slower device generates fewer interrupts per second than a faster device, and if two interrupts appear at the same time, the higher-priority item gets served first. If the faster device has a higher priority, the slower device might never be served.

Is that important in a real-life sense in the PC world? Well, here's one application. If you're going to communicate at a high speed over your modem, use COM2 rather than COM1. COM1 uses IRQ4; COM2 uses IRQ3. That means COM2 has a higher priority than COM1. Suppose you're in Windows downloading data over your communications line and you move your mouse. If the serial port attached to the mouse has a higher priority than the serial port accepting data, you could theoretically lose data on the serial port. I've only seen that happen, however, with modems that can blast data into a PC at 38,000 bps or more.

There's no substitute for knowing what's in your system.



INTRODOS

Tony Roberts

WINDOWS USERS STILL NEED DOS

Unless you have the world's most extensive collection of Windows software, you may find yourself at the DOS prompt a dozen times a day. Why? Maybe you don't have a Windows file compression utility, so you hop to DOS to unzip a compressed file. Maybe you want a quick directory listing of all the files on your hard disk with a certain extension, and you find it easier to get a directory from DOS than from File Manager.

Perhaps you'd rather create directories and copy files from the command line, or maybe you have several favorite DOS utilities for which there just aren't any good Windows

equivalents.

Hopping back and forth between Windows and DOS, however, isn't without its problems. Sometimes, you forget Windows is running and try to run it again. Occasionally, you try to run a DOS command such as Chkdsk, which shouldn't be run while Windows is active.

Here are a few tips for those of you who combine Windows and DOS. And I'm speaking here of Windows 3.1 and DOS 5.0. If you haven't upgraded to the latest versions, you're running a hobbled system.

Prompt Response

How would you like to have a special prompt when you're running a DOS session from Windows? It's easy to do this by setting the WINPMT environment variable. The best place to do this is in your AUTOEXEC.BAT file, right after the Prompt command. Try this, for example: SET WINPMT=Windows is active.\$_\$_\$p\$I.

When DOS is running as a child of Windows, you'll see

the prompt reminding you that Windows is active; otherwise, when DOS is running alone, you'll get your regular prompt.

A DOS Imitation

If you like to issue commands at a command line but you don't want to leave Windows, take a look at a program such as WinCLI (Eschalon Development, 110-2 Renaissance Square, New Westminster, British Columbia, Canada V3M 6K3; 604-520-1543; \$35 for shareware registration).

WinCLI gives you a DOS-like environment in a Windows window. You'll have access to many DOS commands, including Attrib, CD, Copy, Dir, Del, Label, MD, Type, Path, Prompt, Rename, and RD. With these commands at hand, you can carry out most of your file management chores without having to leave Windows.

In addition, you can start any Windows or DOS program simply by typing its name at the WinCLI prompt. And the nice thing about WinCLI is that it looks and behaves like a Windows program. If you run windows in standard mode, you'll probably find WinCLI faster and more efficient than a true DOS box.

A Better-Than-DOS DOS

If you really like DOS and want to take full control of your DOS sessions, you'll like EDOS—Enhanced DOS for Windows (Firefly Software, 1594 SW Fifth, Gresham, Oregon 97080; 800-248-0908; \$39.95).

EDOS gives you all kinds of control over DOS sessions started under Windows running in 386 enhanced mode. With EDOS, you can do all the following.

Run DOS sessions as

large as 736K.

- Set alarms to let a DOS session running in the background signal you when its task is complete.
- Use Alt-F4 to close a DOS session.
- View or print the Windows clipboard from the DOS prompt.

In addition, EDOS gives you several tools to fine-tune your DOS sessions so they're running at optimum speed. The Systime and Boxtime commands can show you how much processing time a DOS application is receiving from Windows, and the Prif and Prib commands permit you to modify a DOS session's foreground and background priorities.

Other EDOS commands allow you to add memory to a DOS session, to change the time slice allocated by Windows, and to set the background or exclusive settings for the session.

If you don't like having a surfeit of PIF files hanging around your system, you can start your DOS sessions with the default PIF and use EDOS commands, either at the command line or in batch files, to modify the session parameters as needed.

On the other hand, if you're already swimming in PIF files but you can't remember which PIF goes with what, EDOS has a solution. From any windowed DOS session, you can choose PIF Editor from the Control Menu to view and edit the PIF that controls the current DOS session.

Another welcome EDOS feature is that it disables dangerous DOS commands, such as Chkdsk, Fastopen, Assign, and Append.

If you really like to call all the shots, in and out of Windows, you'll be happy with the control EDOS provides.

DOS may seem
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ON DISK

Tony Roberts

SCHEDULING, PLANNING, SNOOPING, AND SCROLLING

If you like utilities, this issue's PC disk is worth a gander. With these programs you can run a special batch file of the day, take a quick disk status snapshot, review DOS activity after it has scrolled off the screen, and peer into cryptic command files.

maintenance chores over the course of a week. Some time later, Sheppard decided to put the program to use himself, so he updated it a bit and released it as shareware at the same time. The registration for Daybat is \$5.

What's Left on Disk?

Managing disk space has always been a challenge. Today's systems, with large hard drives subdivided into multiple partitions and network drives increasing storage options, are harder than ever to cope with.

To get a speedy snapshot of the mass storage picture on your system, try Disk Left. Just a quick screen gives you the stats on drives A-Z if you have them. This program tells you at a glance

where you can store those multimegabyte graphics you can't bear to delete.

Paul Muñoz-Canon offers Disk Left as a free program.

Furniture Mover

If you're tired of shoving that sofa from one end of the house to the other only to find it doesn't fit, boot up Home Plan and let your computer do the heavy work.

Home Plan is a mini-CAD program that helps you create and print floor-plan-type drawings. The software even includes a small library of standard home furnishings—beds, sofas, fixtures—that can give you a quick start in organizing your dream home.

Programmer and home planner Charles Herndon has been working on Home Plan for several years. The program started out as a fairly crude BASIC program, but it since has become a more polished program constructed in Turbo Pascal.

Home Plan features automatic dimensioning, adjustable cursor speed, square footage calculations, and optional display of framing (studs, joists, etc.). The program includes online help that puts all important commands only a keypress away. Home Plan is shareware with a \$20 registration fee.

SuperSnooper

Find the hidden text in program files with SuperSnooper. In this ingenious adaptation of programming columnist Tom Campbell's Snooper program, COMPUTE editor Clif Karnes has created a single program that can run both from the DOS prompt and from within Windows.

SuperSnooper lets you see beyond the binary to discover hidden information about the programs you use every day. When the program is activated, it displays all of the ASCII text strings contained within a file. With SuperSnooper you can peer into forgotten utilities to locate help text, or you can search for undocumented switches and commands.

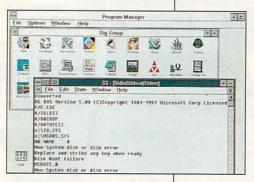
When you run the program from within Windows, you'll be able to scroll back and forth through the output, and you'll be able to use Windows' Cutand-Paste feature to duplicate or move information.

There is no fee for Super-Snooper.

Scroll Through DOS

One of the most frustrating aspects of working with DOS is that once something's scrolled off the screen, it has gone forever. JCSCROLL solves that problem by creating a scrollable buffer through which you can review the directory listing or text file

SuperSnoopar lets you discover hidden information in programs you use every day.



And to go with those utilities, the disk includes a couple of applications: a home planner and a label manager to put your PC to work.

A Batch a Day

Many people rely on a weekly routine to help keep them organized. Laundry on Monday, pizza on Tuesday, bowling on Thursday, banking on Friday. If you'd like to set up a weekly routine for your computer, Daybat is the answer.

James Sheppard's utility simply determines the day of the week and then runs a batch file for that day. This allows you to run certain programs or perform specific PC maintenance chores, such as a virus scan, on a regular schedule.

Sheppard, a BBS sysop, created the program at the request of a fellow sysop who wanted to spread out his BBS



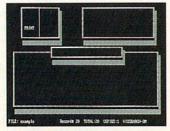
Daybat



Disk Left



Home Plan



The Ultimate Label Manager

that just flew off your screen.

The program, created by Jeffrey Chasen, installs as a TSR. DOS behaves as normal until you press the hot key that activates JCSCROLL. Then, you can browse through as many as 150 lines of text at your leisure. JCSCROLL, which is offered as shareware with a \$10 registration fee, also can be activated from within text applications. For example, it's possible to review recent DOS ac-

tivity from within word processing software.

The program uses 4K of memory for every 25 lines of buffer space reserved.

Ultimate Label Manager

Addressing envelopes is a task I dread. Handwriting as bad as mine surely must tax the automated sorting equipment at the post office.

Enter The Ultimate Label Manager, a name and address database from Jeff Napier's Another Company. This nicely designed program gives you full control over a small mailing list, whether it's a database of your family and friends or business contacts.

The program lets you enter labels and then edit them, search them, delete them, or print them. There's a large note area associated with each label that can be used to jot down notes about your friends or customers.

The Ultimate Label Manager includes a Zipsort option that will sort your database by zip code to make it easier for you to comply with bulk mailing regulations. The program prints label information to standard 3½- × 15/16-inch labels and will print, notes and all, on standard 8½- × 11-inch paper.

You can print from 1 to 60,000 copies of any label, so the program works for diskette labels as well as mailing labels. The Ultimate Label Manager is shareware with a registration fee of \$29.95.

So Why Register?

The software included on COMPUTE's PC disk is created by programmers who've invested their time and energy into developing reasonably priced programs. These programs are made available as shareware, which permits you to use and test them before buying.

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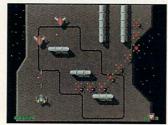
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Steve Draper

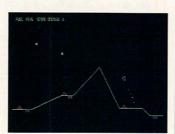
FUTURE CLASSICS

This month, COMPUTE's Share-Pak brings you three outer space shoot-'em-ups. Each of these three arcade space games is packed with all the features you'd expect to find in a commercial package costing upwards of \$40. Two of these gems, STARFIRE and Xerix, were programmed in Australia and give you a glimpse of the shareware quality in the land down under.

March's SharePak features three out-of-this-world programs.



Save humanity from alien invaders in STARFIRE.



Conquer faraway worlds with GRAVITON.

STARFIRE

With six levels of action worthy of coin-op arcades, STARFIRE is for one or two players. As usual, the Earth is under attack by a cowardly race of conquering aliens. This time they're called the Sloboids, and they're sending six huge "mother destructor craft" toward Earth. Each ship carries weapons capable of destroying entire planets, so all of mankind is threatened.

You must destroy the huge the alien mother ships which are currently headed toward Earth. As you swoop down across the bow of each ship, then fly across the deck, you'll encounter heat-seeking missile launchers, gun turrets, and enemy fighters. You also have to avoid the various structures and pipes that protrude from the deck.

The situation isn't as hopeless as it seems. Your ship is far from defenseless. Use laser cannons and bombs to destroy enemy craft, gun turrets, and missiles.

STARFIRE requires an IBM PC or compatible running at 12 MHz or faster and VGA graphics. Joystick, mouse, and Ad Lib and Sound Blaster card support are provided. The registration price is \$20 (Australian dollars).

Xerix

Xerix (eXtended Enemy Response and Infiltration eXperiment) puts you in command of that project. Your mission is to stop a huge alien structure that's hurtling toward the Earth and emitting deadly radiation. After an unmanned probe is destroyed, the World Council decides to send you in the lone Xerix spacecraft to destroy the giant object. You don't know how you'll stop the alien craft, but you're Earth's only chance.

The object of the game is simple: You must guide a fighter through a strange structure with two different levels and destroy or avoid the many enemy obstacles that stand in your way. The alien structure's weapons are formidable and range from bouncing space mines to multiturreted bomb launchers. Destroy the end-of-level alien, a guardian of the alien ship, to advance to the next level. You'll need sharp reflexes to finish this mission.

Xerix features 256-color VGA or MCGA graphics and Ad Lib and Sound Blaster sound card support. Other features include multilevel and multirate scrolling, expanded and extended memory support, and mouse and joystick support.

Xerix requires an IBM PC or compatible, a VGA or MCGA video display, and a hard disk or floppy disk with 500K free. A computer with a processor speed of 10 MHz or faster and a hard disk is recommended. Xerix is a free program.

GRAVITON

GRAVITON is a challenging arcade game with the appearance of color vector graphics and with the look and feel of arcade games like Asteroids and Star Castle.

Your mission is to invade four solar systems, each with a sun and four planets. Each planet has three types of defenses: defenders, floating mines, and enemy spaceships. To conquer each planet, you'll have to destroy every defender on the planet,while constantly swooping down to pick up fuel from enemy fuel dumps to power your ship. There's only one important rule to remember: Don't let your ship touch anything.

As if that's not enough to worry about, this game goes beyond its arcade predecessors and adds the influence of gravity to the game. You can use gravity to your advantage or try to fight it. Learning to control your ship is the key to success in this game.

GRAVITON features a highscore file, sound, and a keyboard-scanning TSR that allows much better realtime play than standard BIOS calls.

GRAVITON requires an IBM PC or compatible running at 12 MHz or faster and EGA or better graphics. The registration price is \$10.

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You've heard it a hundred times before: Back up your hard disk. It may be as unglamorous as flossing your teeth, but backing up is an absolute necessity if the information stored on your hard disk is important to you. One day, some strange twist of fate will scramble your presentation data four hours before you need

it, wipe out the Great American Novel an hour before you hard drive in many ways. It's not seen by your computer as a traditional drive unit. You can't change to the tape from the C prompt and load a file. And tape units are slow and sequential, having to fast-forward or rewind to find the appropriate file or group of files.

Tape units can, however, store the contents

of your entire hard drive in a single pass, giving you the option of a

BACK IT UP WITH

intended to print a copy for your agent, or destroy a year's financial data on April 14.

Tape backups have never been so economical. You may even find that they're less expensive than the floppies that would be necessary to back up today's huge-capacity hard disk.

Virtually everyone with a computer has a hard disk horror story to tell.

Fortunately, the options for backing up have broadened in recent years, and several of the backup strategies have payoffs beyond just maintaining a healthy level of data redundancy (as well as your sanity).

Floppies were once the only cost-effective method for backing up a personal computer's hard drive; the other choices were either non-standard or expensive beyond belief. Things have changed, and now quite a few options have emerged that are less expensive and bothersome than floppies.

Probably the most useful backup device is the tape drive unit. Tape backup units reside in a floppy bay of your computer (or on the desk beside it) and use digital data tapes to store large chunks of information in sequential order. Due to the unit's relative simplicity, the cost of a tape backup isn't much more than that of a floppy drive, and when you factor in the cost of the tapes, the cost per megabyte of storage comes out strongly in the consumer's favor (quarter-inch tape cartridges run anywhere from \$30 to \$80).

A tape unit is different from a floppy or a

nearly painless restoration of your data after a crash (several Tylenols might

still be needed). Also, because of its ability to save large chunks of information, a tape drive is useful in several other data-intensive situations.

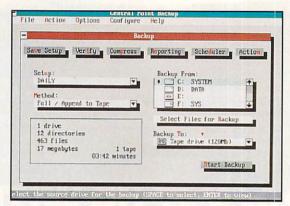
Cartridge tape drives come in two general flavors: drives that use 6000-series tapes and can store up to 1.35 gigabytes of data, and drives that use mini or standard cartridges (2000-series cartridges). The least expensive tape drive, and the type best suited for the single-station PC, is an internal quarter-inch drive unit that uses the 2000-series tapes. This unit fits into a spare 5½-inch drive bay (though lomega makes one to fit into the smaller 3½-inch bay) and is run either by your computer's own floppy controller unit or more efficiently by an independent controller card.

A tape drive isn't fast. The standard speed is 500 kilobits per second, but some controllers can boost this to one megabit per second. And thanks to good software, the backup procedures can be scheduled to run during times when you're not around.

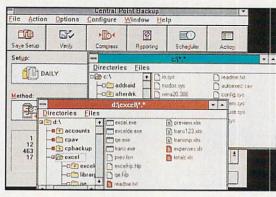
A tape cartridge is different in many ways from a standard audiocassette. The most notable difference is in the movement of the tape itself. An audiocassette contains only audiotape, which is moved by individual drive motors that fit into the take-up

A quarter-inch data cartridge contains a drive system as well as the tape itself. A belt actually contacts the tape on both reels. allowing the drive unit to operate the tape with only one motor. which contacts the belt capstan. The cartridge itself takes care of maintaining tension and a constant speed as the tape moves from one reel to the other. The linear velocity of the tape is equal to the speed of the belt, no matter how much tape is on either hub. There's no need for a pinch roller or clutches for the take-up hubs. This makes it possible for the tape drive to be as simple (and inexpensive) as possible.

Quarter-inch tapes record with either 20 tracks (QIC-40) or 28 tracks (QIC-80) across the tape. The information about each tape's contents is stored at the beginning of the tape, and a program must search there first to find the location of a block of information. It will then fast-forward into the tape the indicated number of feet and see if the data is there. Since there is no explicit tracking information, a



Central Point Backup for DOS offers menus and mouse support.



Central Point Backup for Windows provides backup in a graphical environment.

tape drive will often overshoot or undershoot and will have to adjust its position. Needless to say, a tape's speed is much slower than that of disk-based media.

Beyond the QIC tape format, tape drives are also available in 4-mm digital tapes (DATs). These drives are considerably more expensive than QIC-2000 drives, but a 4-mm tape can store as much as two gigabytes of data on a single cartridge. This larger capacity puts it beyond the practical need of most single-computer users, but it's a viable format for huge files, networks, and industrial applications.

Another type of drive is the helical-scan unit. A helical-scan drive uses either a 4- or an 8-mm tape for a capacity of up to five gigabytes per cartridge. The helical-scan system records information at an angle, utilizing a rotating head much like a VCR's; this allows more information to be accurately placed on a length of tape than a standard QIC format.

The Hardware

Let's take a look at a selection of

Things to Watch Out For

Most drive manufacturers label their drive's capacity in the most favorable light. A 120MB drive is actually a 40MB drive that can use a 60MB extended-length tape which has the capability to hold 120MB with optimum data compression.

Most backup software will give you an estimate of backup time and space. While drive manufacturers give you a best-case estimate, the software will give you a worst-case estimate for time and compression (it will generally take less time and space than the software tells you).

Try to find out what the best hard-ware-to-software matches are before you purchase either. A great drive may not be recognized (even if installed correctly) by the backup software you're considering. When in doubt, call the manufacturer. The software maker will know more about the hardware than the hardware maker will know about the software.

Try to find a drive with more than enough capacity to back up your entire hard disk. A 120MB tape drive may or may not be able to back up your 120MB drive on a single tape.

Find a tape drive that uses a widely accepted data format (such as the QIC-40, QIC-80, or Irwin format).

If you're using your tape drive to shuttle information between two computers, use a format that can be read by different hardware and software products, like the QIC-40 or QIC-80 format. Also, make sure your software is set to record in this format, not in its own format.

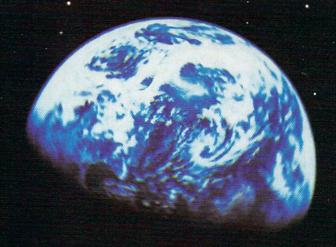
Remember that a tape backup file, even if it contains your whole hard disk and all of its component directories, is only a stream of data and not a collection of individual files. Therefore, you can't access part of a backup file or a single directory in your hard disk backup. Since the tape records only the bits stored on your hard disk in one long stream, it doesn't know the difference between a directory name and an INI file. It's up to your backup software to interpret the tape's data stream into a coherent directory structure.

If you want your backups in dis-

crete units, you have to organize your backup files yourself. Try making one backup of all your graphicrelated directories, another with your word processor directories, and yet another with your database directories. This way, you can access related groups of files (or directories) on your tape cassette. Backing up in smaller, directory-based units will also speed your backup time. By breaking your backups into smaller units, you won't affect your overall directory structure in any way; backup programs take great pains to make sure that when you restore your hard disk, the proper directories are in the proper places.

Many backup programs have a hard time dealing with screen savers. Turn off your screen saver before backing up.

A tape drive system is not like just another drive. You can't access it from the C prompt, and most software must be trained to search out a tape device the first time the device is installed. It's a special-function unit with very limited uses.



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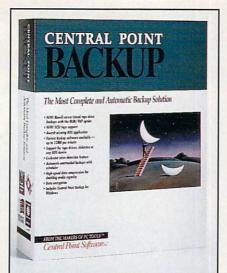
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Circle Reader Service Number 199

the hardware products you can use for backup.

Jumbo 120 and Jumbo 250. One of the least expensive drives, Colorado Memory Systems' Jumbo 120 is a strong contender for the best value. A drive unit can be fairly simple, and the Jumbo 120 is a no-frills unit. Fortunately, you really don't need the frills, and the Jumbo drive (also available in a 250-megabyte size) does its job very well.

The Jumbo 120 is a QIC-40 drive, while the Jumbo 250 uses the QIC-80 format. The drive installs into a spare full-size drive bay and comes with a cable allowing you to piggyback it onto your floppy controller card (be sure to ground the unit according to the instructions). The drive works well even if you already have two floppy drives (in addition to your hard drive)



Central Point Backup

connected to the card. While the Jumbo will work well with nearly all floppy controllers, the manufacturer warns that there may be some compatibility problems, and an extensive compatibility chart is included. (The Jumbo 120 will work on XTs and ATs, while the Jumbo 250 requires an AT-compatible computer.)

The Jumbo comes with its own software package, but like most manufacturer-supplied software, it leaves something to be desired. However, the Jumbo drive works effortlessly with most third-party backup software.

Accutrak A250 and EzPort A250 EP. The Irwin Accutrak drive is similar to the Jumbo 250, except that Irwin drives use Irwin's own tapes and backup format (the serpentine format, with either 20 or 32 tracks on the tape). The internal drive installs easily

Installing an Internal Tape Drive

Installing any peripheral in your computer requires equal amounts of caution and confidence. The computer is a very sensitive device, and it must be handled with care. The power supply inside the computer is also capable of delivering dangerous jolts of electricity. But armed with common sense, you'll find an installation project can be quick, easy, fun, and even a learning experience.

The first course of attack is to study your installation manuals thoroughly before you open the computer case.

Generally, when installing a tape drive, you'll install a controller card first (if the system has one). If the system doesn't come with its own controller, it will probably use your floppy drive controller. Then, you'll install the tape drive. Dog-ear the page in your controller manual where it discusses the default settings for the card (such things as address, interrupt request, and DMA channel-all information telling your computer where to find and how to access your tape drive). In about 70 percent of the cases, the default settings are fine; but if you have a second hard drive or a modem or any of a multitude of other peripherals installed in your computer, you may have an address conflict.

Before you approach installation, be sure to unplug your computer's power and the power of any peripherals. Open up your computer case. If you have never opened it up before, refer to your computer's general manual to see how the case

cover comes off. Some cases are hinged, but most are opened by removing screws in the back panel and pulling the case toward the front of the machine.

Follow the controller card instructions carefully, and try to place the controller in a slot with some space around it. You're going to have a big ribbon cable coming off the card, and you want the airflow to be as free as possible. Note that some cards require a power connection while others do not. (Hint: Read ahead, and connect the ribbon cable before you fit the card into the slot-there isn't going to be much room for your fingers once the card is installed. Generally, cable connectors on the card are marked with a 1 or some other mark and cables are marked with a red wire. The red wire goes on the end marked with a 1.)

After the card is in place, next comes the drive. Locate a suitable drive bay and check out what type of installation you'll need: plastic slide bars or a metal chassis. Generally, the manufacturer will supply what you need for either type of installation. Slide the drive in, and see if the screw holes align as they should. Make sure the drive isn't disrupting other components in your system.

Pull the drive out, and try to pull the ribbon cable and power cord through the bay. It's much easier to make the connections in the light of day than to fiddle around in the dark corners of your computer, trying to get the pins to match up properly. After you make the connections,

slide the drive back in and secure it according to the manufacturer's instructions.

For the moment, leave your computer uncovered and power it back up. Follow the software instructions, then test out the drive. If you leave the computer open, it will be easier to change the addressing options if the software can't find your tape drive or if the installation program tells you that there's a conflict.

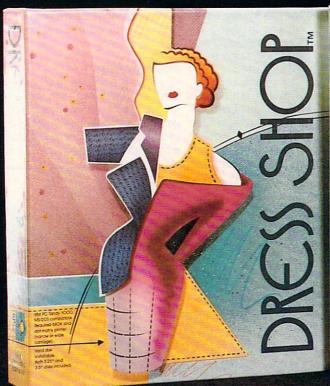
If there is an addressing problem, it can manifest itself in several ways. Sometimes, the software will tell you that there's no tape drive connected. Other times, it will tell you that one or another of the addressing options isn't valid.

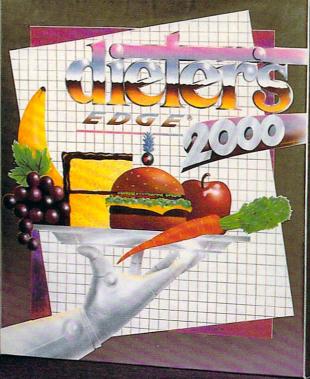
If either of these things happens, shut off your computer and unplug it, turn back to your controller card instructions, and try out some other combinations. The manufacturer will generally let you know other addressing-option combinations to try. Stick to the manufacturer's combinations; trying to create your own combinations may harm the controller or the tape drive.

Be sure to power down, unplug the system, and touch something metal to discharge any static in your body before putting your hands inside the computer case.

Once your software recognizes the drive, power the system back down and close your computer up. Power back up, and you're ready to go. (See the feature titled "World of Conflict" for more information on address conflicts.)

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and can work with either your floppy controller or a dedicated card (though there's a substantial speed increase with a dedicated controller). Since Irwin uses its own format scheme, you are limited to the manufacturer's supplied software. I was able to get Central Point Backup (see below) to write to the drive using Central Point Backup's own backup format (not QIC), and it worked fine.

Irwin also manufactures the EzPort drive. Basically the same tape unit, this drive is external and uses your computer's parallel port for data exchange (the drive provides an additional printer port as well). This limits you to using Irwin's software exclusively, but the trade-off is ease of

installation and a system that is entirely portable (drive and all) from computer to computer. This drive would make a useful addition to a small office with several computers. It's an inexpensive means to support sneaker net on a mass scale.

Tape250 Insider. lomega has just released its Tape250 Insider tape drive, which fits into the smaller 3½-inch drive bay in your computer. This is a great plus, since not much else can fit there. The drive is rated at 250 megabytes, and it has the unique capability of being able to read both QIC (40 and 80) and Irwin tape formats. The Insider can be connected to your floppy controller, but it works best with lomega's one-megabit-per-

second card, which installs into a spare slot in your computer.

I noticed that the drive didn't seem as sturdy as the others I've mentioned, and it wobbled when I inserted a tape (even though the chassis was securely mounted), but the unit performed properly despite this minor design problem.

The lomega drive comes bundled with Central Point Backup for both DOS and Windows.

The Software

While tape drives generally come bundled with their own manufacturer-specific software, dedicated third-party backup applications can be a productive investment. While not all software works with all tape drives (it's a good

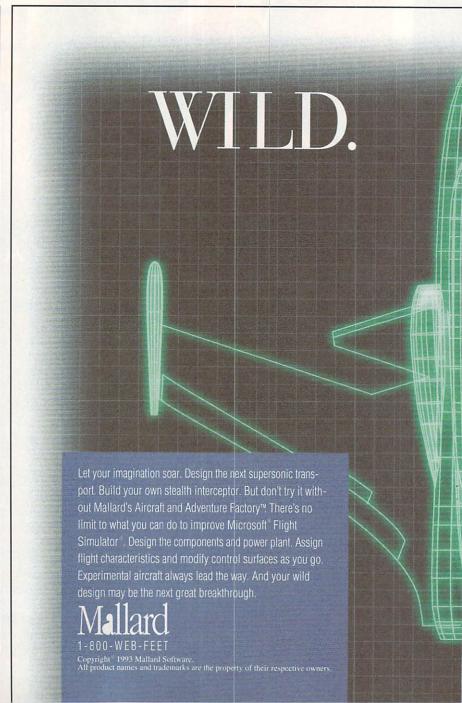
Recovery from a Hard Disk Failure

Sooner or later, your hard disk will fail. So be sure to have a floppy boot disk available at all times. If your whole hard disk goes, getting your machine up and running will take some time, so be patient.

First, boot up the computer, take a deep breath, get out those DOS disks, and reinstall DOS (and Windows, if you have to) on the hard drive. If you can't boot from the hard disk, boot from a floppy (you do keep a bootable floppy on hand at all times, don't you?) and attempt to log to the hard disk. Once you get to the hard disk, check to see what files are still available. If nothing seems to be available, thank your lucky stars that you kept regular backups and proceed to reformat the hard drive. If you can't log to the hard disk, you should try to reformat it. When the hard disk is formatted, install DOS. Then, install a utility program and check out the disk.

When you are satisfied that your hard disk is operating properly and your operating system is installed, it's time to install your backup software, run the software, and restore the last full backup of your disk. Then, restore the latest data backups, and you should be up and running as if nothing had ever happened. Nightmare averted!

Remember to be patient, to be prepared, and to take the inevitable with a sense of humor. You'll wow them at your next office party as you tell the tale of how you rescued your data from the edge of the void.



idea to find out if your drive and the software you're interested in are compatible before you buy either; call customer service if you have any questions—that's what it's there for), most packages are flexible enough to allow a wide range of options.

Generally, backup software allows you to do four things:

- Back up your files on demand
- Back up your files at a specified time (whether you're there or not)
- Restore your files
- Compare files on your hard disk against files already backed up

When you're backing up files, you can choose to back up either the entire



Colorado Memory Systems' Jumbo 120 internal tape drive

hard disk or only certain files or directories (generally those files and directories that change most often). These selections can be saved to a file so that each user can have his or her own set of preselected files, even from the same computer system.

The software will also allow you to compress your files to save space on the tape cartridge, disk, or other storage medium. Most programs also have tape-specific functions available, such as formatting and erasing a tape, as well as displaying a directory of what has been previously backed up on any tape cartridge.

Fastback Plus. Fastback Plus is a very fast, very intuitive backup package (note that, as of this writing, only the DOS version of Fastback Plus supports QIC tape drives). Selecting specific files and saving those selections

to disk is simple.

Though the program backs up very quickly, the manufacturer warns that there may be problems when making high-speed backups from a fast 386 or 486 machine. Fifth Generation Systems recommends that you compare your backup data each time to make sure that it's safe.

One powerful feature of Fastback Plus is the ability to create macros to automate and customize your backup operations. Macros can be created by recording all of the steps needed to perform any particular operation. The macro files are ASCII files that can be edited with the included text editor. Fastback Plus includes a complete guide to its macro command language in the user's manual.

Another very useful feature of Fastback Plus is its ability to create a snapshot of your hard disk's files. A snapshot doesn't record the actual data, but only the directory and file structure of your disk. You can use the snapshot function to take a picture of your disk at an optimum state (with no help files, for example). Then, when you need to restore your data, you can use the snapshot to filter the restoration to your own preferences.

Central Point Backup. Combining an intuitive interface with all the options you'll ever need, customizable support for nearly all types of backup devices, and a very fast backup rate, Central Point Backup is a stand-alone version of the hard disk backup program found in Central Point Software's PC Tools utilities package.

When you first load Central Point Backup, it will ask if you want to configure your system. It will automatically find floppy drives, removable hard drives, and some tape drives. Other tape drive systems have to be manually configured, and Central Point Backup has a very good search function that will locate most drives. If you have to manually configure a drive, you must supply the address, IRQ, and DMA



channel.

Selecting specific files to back up is easy with Central Point Backup. You have a visual display of your hard disk tree, and you can select or deselect files or entire directories or paths. If you save the file selection, the next time you load that setup, Central Point Backup will scan the hard drive for any additional file changes and append those to your list of files to back up.

Central Point Backup also allows you to print out the file structure of your hard disk and provides password protection and virus scanning.

The Norton Backup. The Norton Backup supports tape drives and performs nearly as well as Central Point Backup. However, it only supports tape drives connected through your floppy drive controller and doesn't recognize drives with their own controller cards.

The Norton Backup, like Central Point Backup, provides several user levels. At the advanced level, the user can select various data compression schemes, cancel overwrite warnings, and provide password protection. The Norton manual is the best I've seen, giving good advice and providing a separate pamphlet on recovering from



Irwin EzPort external tape drive

hard disk failure, including a section on how to get up and running using Norton's Emergency Restore program.

Backing Up Right

Don't do full backups too often unless you're running a network whose configuration changes from day to day. When you do a full backup, break it into two parts: applications and data. This strategy not only saves time, but if you have to restore your hard disk, then you'll be optimizing it as well (be sure to restore the applications first). If you change, upgrade, or add applications, consider doing another full backup.

Analyze your own working environment to determine the best backup strategy (suggestions abound in the manuals, but it's more effective to tailor a backup program to your own needs). What programs do you use most often? Do you work with many files or a single file during the day? Try to organize your hot working projects into directories that you can back up as a unit.

If your computer runs constantly, set up a scheduled backup for the evening, when you're gone. Be sure to turn off your screen saver (it won't matter if you also turn off your monitor when you leave at night).

Test out a scheduled backup before you rely on it. The scheduling program is a memory-resident program that might interfere with other programs on your system.

For normal uses, a complete backup every month or so, with a daily backup of all your latest files, will be all the protection you'll ever need. This is the first line of defense against both disk crashes and viruses.

Hard Drives, Easy Choices

Hard disks are taken for granted on today's PC systems. It's difficult to imagine what life was like when there was just a box full of floppies for all of your software and data. But like all things taken for granted too long, a hard disk can and will fail (Murphy's Law stacks the deck against you). Most of the time, the failure doesn't mean the end of your hard disk's life—just the end of any important data you've neglected to back up.

Backing up offers the safeguard of redundancy to protect the time, money, and effort you've invested in your data. You can back up to floppy disks manually using the DOS Backup command, but with the size of today's hard drives, a quarter-inch tape system is a better alternative. The price is reasonable, the media are readily available and standardized, and the software is on the shelves.

If you have a really large hard disk, Tandberg Data (805-495-8384) and Sankyo Seiki have developed a 2 GB QIC technology. The least expensive Tandberg unit, the Panther 2000, costs \$3,495. It can back up data at a rate of 300K per second, or 2.4 Mb per second.

Soon, Bernoulli drives and magnetooptical drives (and perhaps other formats yet to be imagined) may be the alternatives of choice, but for now, the price for these options is still too high to justify their use as backup systems for a personal computer's hard drive.

Only you know how valuable your data is. But if you need protection, a tape drive unit is the way to go.

Hardware and Software

Irwin Accutrak A250 (internal) \$349 Irwin EzPort A250EP (external) \$548 Archive Maynard Electronics Division 36 Skyline Dr. Lake Mary, FL 32746 (407) 263-3500

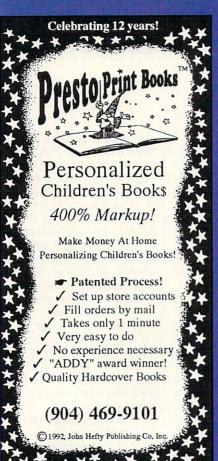
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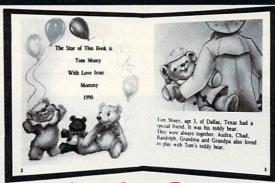
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PERSONAL PRODUCTIVITY

Philip Chien

MOUSE EVOLUTION

In this day of WYSIWYG word processors and GUIs, pointing devices are considered requirements instead of options. With all of the different pointing devices available, there's plenty of confusion.

The key difference among pointing devices is how movements are measured. Absolute devices like digitizing tablets have a 1: 1 correspondence between the pointer's location and the position on the screen. While these devices are excellent for sketching. they require large hand movements for most operations. Most pointing devices use relative motion. When the device is moved, the cursor moves a proportional distance on your screen. Accelerated-movement pointing devices require less hand motion to operate.

As a rule, pointing devices connect to a serial port (serial mouse) or to a special controller card (bus mouse). The primary advantage of a bus mouse is that it doesn't take up one of your serial ports, while a serial mouse costs less because it doesn't need

an additional card.

Here are three typical pointing-device upgrades. One of them might be right for you.

Installing a serial mouse. It's extremely simple to install a serial mouse. Just plug it into a spare serial port. Serial mice use standard DB-9 serial connectors. Most will include an adapter for computers with 25-pin serial connectors.

Your device should come with a software driver. The driver should be compatible with Microsoft or Mouse Systems drivers. Follow the directions to install the MOUSE.COM or MOUSE.SYS driver, configure your programs to tell them to use your mouse as an input device, and you're ready to go.

Upgrading a serial mouse to a bus mouse. For many users, the two standard serial ports will be occupied by a mouse and a modem. But what happens if you need to install an additional serial device? It's possible to add more than two serial ports to a computer, but another solution is to convert from a serial to a bus mouse.

Bus mice have slightly better software support than serial mice and are slightly more efficient. A serial-to-bus converter consists of a half-slot controller card with a DB-9 connector. Your pointing device is plugged into the card, which converts the device's signals so they look like those of a bus mouse. Any serial pointing device that looks like a mouse (for example, a trackball) can be attached.

The important things to remember when converting a serial device into a bus device are that you must upgrade your driver to the bus driver supplied with the card and that your programs must be reconfigured to indicate that you're using a bus mouse.

Upgrading to a more sophisticated pointing device. Your computer may have come

with an inexpensive mouse. While that mouse may be adequate for simple tasks, you might want a better pointer for fine-resolution desktops, CAD, or drawing applications. If you're using a new pointer with the same physical connector (for example, if you're replacing a serial mouse with another serial device), then you may be tempted just to leave the software drivers alone, particularly if everything appears to be working properly.

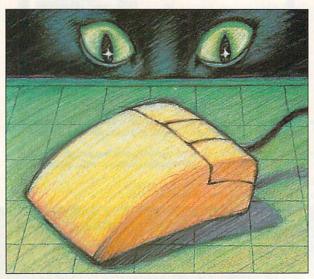
This solution works because most pointing devices emulate the Microsoft Mouse, and a new device usually will work with your existing drivers. However, if you don't update your drivers, your software won't recognize the device's special enhancements.

To use your pointing device to its full potential, install the drivers that came with your new device and reconfigure any program that lists your device among its choices. If you have a program that doesn't specifically support your pointing device, it's appropriate to select a generic mouse or pointing device.

One of the simplest upgrades is just to make sure you're using the latest Microsoft driver for your standard mouse. Microsoft drivers come with most Microsoft products. If your mouse does more than the standard Microsoft mouse, check periodically with your manufacturer for upgrades. Most manufacturers operate bulletin boards where these drivers can be downloaded free of charge.

A properly installed pointing device, with software designed to use it to the limit of its capabilities, is an excellent enhancement for any computer. Try out a few pointing devices before deciding which one to use. The variety of options assures that one will be perfect for your work.

A properly installed pointing device, with software designed to use it to the limit of its capabilities, will enhance any computer.



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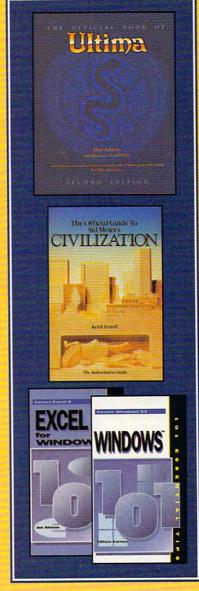
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PRODUCTIVITY CHOICE

This powerful database heats up the Windows market.

Richard Rapp

APPROACH FOR WINDOWS 2.0

Love it or hate it, no one can deny Windows' overwhelming success in both the home and business markets. Applications like Excel and Ami Pro offer enough power and flexibility to handle almost any job that comes along. But despite its excellent applications, Windows has been woefully deficient when it comes to database management systems. Until recently, that is.

Approach for Windows has changed the picture. Its initial version offered plenty of features and an easy upgrade path from existing database packages. Now, in version 2.0, it provides the speed and power necessary to make it a leader in the Windows database market.

One of Approach's main strengths has always been its excellent compatibility with existing products. Third-party products enable it to access DB2 databases, and it can also import and export data from both Lotus 1-2-3 and Microsoft Excel.

For network users, Approach supports most major networking systems. Best of all, there are no LAN packs to buy and no special setup is required. System security features have also been upgraded in version 2.0, offering a variety of record-locking and password-protection options.

Approach's designers have updated its interface with Windows 3.1 in mind. It now uses the most current versions of Windows' common dialog boxes to maintain consistency of look and feel with other Windows 3.1 applica-



tions. It also sports new thermometer gauges to show the progress of sort and find operations, and it has a previewmode button to allow the user to access this frequently used option with a single mouse click

Approach offers the user many options for manipulating data and uses the Windows environment to good advantage with its PicturePlus fields. These fields enable it to handle some data types not supported by standard databases. Validation options allow the user to enter data automatically in some cases or to ensure that it meets specified criteria. Approach also supports check boxes, radio buttons, and several styles of pick lists to help ensure fast. consistent data entry.

PicturePlus fields have been greatly enhanced since Approach's original release, and they offer some interesting possibilities. Using Windows' OLE capabilities, they allow the user to store objects created in other applications in Approach databases. Such objects could be graphs, charts, pictures, or even sounds. The objects maintain a link with the appli-

cations in which they were created, so with a simple mouse click, that application can be called up and the object edited. For graphical objects, Approach supports most of the popular formats, including BMP, EPS, PCX, and TIFF.

Approach's paper metaphor makes designing forms and reports a snap. Graphical objects represent fields. headings, subtotals, and the like, and the user simply drags them into place with the mouse. Optional rulers and a user-definable grid help keep everything aligned properly. Pages can include headers, footers and multiple fonts, and you can specify automatic insertion of the time, date, and page number. Files can include up to 50 forms, reports, and mailing-label definitions, a hefty increase over the previous limit of 16 definitions per file. Approach can also perform mail merges.

The program makes short work of producing mailing labels. If you use Avery-brand labels, you simply choose the appropriate part number from a pick list, and Approach formats the labels au-

tomatically. No hassle, no bother, no wasted time. Approach can handle about 50 different styles of labels, so even if you're using a different brand, you can probably find one that works. If not, you can still easily create custom formats.

At the heart of this program, though, lies a powerful relational database. Approach allows up to ten databases to be joined at a time, in any combination of file formats. It also presents a graphical depiction of the relationship among joined databases, so you can confirm that you performed the operation correctly. You can create oneto-one, one-to-many, and many-to-one relations with a few mouse clicks, and Approach handles much of the formatting of information from the child records automatically. In network environments. you can choose between pessimistic record locking, in which only one user at a time may access a particular record, or optimistic record locking, in which Approach allows simultaneous access but keeps users informed as changes are made.

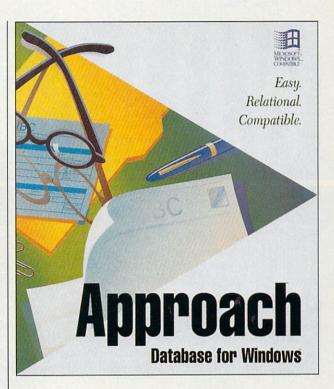
Approach uses a form of query by example to specify search criteria. It displays a blank version of your regular data-entry form, and you simply type the search criteria into the appropriate fields. The criteria may contain wildcards or specify a range of values, and searches can be case sensitive or not. A new wrinkle in Approach's search capabilities is its ability to perform "sounds like" searches. This feature enables Approach to find records that are phonetically similar to the search criteria, so that finding oddly

spelled last names, for example, is no longer a hassle.

Though Approach doesn't support a full-fledged programming language, such as one of the various xBASE dialects, it does have a very complete macro language for automating common tasks. Creating macros can be as simple as clicking your way through a couple of dialog boxes, and you can attach macros to onscreen buttons. Features added in version 2.0 allow you to assign macros to function keys, chain macros to unlimited depth, and create special macros that execute when a file is opened or closed. Approach also now supports variable fields, which act just like global variables in a regular programming language.

The designers have done an excellent job of improving the program's speed in several areas. Claimed improvements include the ability to sort 10 times faster than version 1.0 and save files 100 times faster. It also is said to be 100-percent faster in importing and exporting data. While an in-depth evaluation of these claims is beyond the scope of this review, my impression is that the speed improvements are substantial. though Approach itself still takes far too long to load. PicturePlus fields represent an improvement in its support for Windows' OLE capabilities, and system security is greatly enhanced by its support for read-only fields and many password options.

Still, despite these improvements, Approach has its share of faults. It supports only one level of undo, the unfortunate standard among Windows apps, and its icons' functions are not always obvious.



Plan to spend some time thumbing through the well-written manuals familiarizing yourself with them.

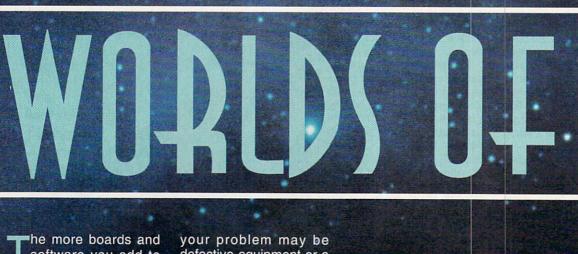
Upgrading from version 1.0 is easy. Approach can install itself over the older version, leaving all user files intact. When opening view files or using indexes created under version 1.0, Approach gives you the option of updating them so they can take advantage of the new features. Once they're updated, though, they won't be readable by version 1.0, so make a backup if you plan to run both versions.

With the recent release of several products and the promise of more to come, the Windows database market is heating up. But if you need a powerful relational database right now, Approach for Windows 2.0 has no equal.

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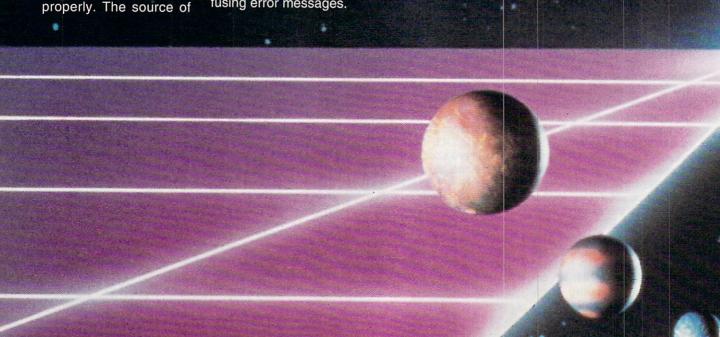
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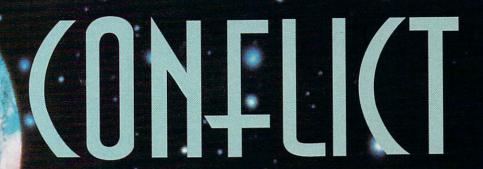


The more boards and software you add to your computer, the more likely it is that you'll experience interrupt conflict. Here's how to identify and resolve conflicts.

You've just added a new accessory to your computer, and suddenly something doesn't work anymore. Or a new device hooked up to an input/output (I/O) port doesn't seem to work properly. The source of

defective equipment or a bad cable, but it's more likely to be a hardware interrupt (IRQ) conflict. Interrupts are the way an I/O device such as your modem or your keyboard can tell your computer that it needs attention. If you have two devices set to the same hardware interrupt, they can conflict with each other, which can result in strange and often confusing error messages.





What's especially mystifying is that it's possible for an interrupt problem not to show up for a while. You can be using your computer for a long time without any problems, and then suddenly something strange happens, possibly because you're using a new program or an old program you haven't used for a while or because you've upgraded an existing program to a new version that uses interruptdriven drivers.

The Polite Interrupt

While interrupts may be confusing, they're extremely useful tools for your computer, especially when it's communicating with the outside world. For example, a send/receive fax/modem generates an interrupt when its phone line rings. Your computer's processor recognizes the interrupt, temporarily stops the program it's running, runs the fax subpro-

BY PHILIP CHIEN

Table 1: Standard Interrupts

IRQs marked with the word reserved are not used for standard I/O devices and can be assigned to user.

XT-class				
IRQ	Purpose	IRQ	Purpose	
0	timer	5	hard disk	
1 2	keyboard	0	controller	
3	reserved COM2 serial port	6	floppy drive controller	
4	COM1 serial port	7	LPT1 parallel port	

AT-class computers (including ATs and higher-performance

IRQ	Purpose	IRQ	Purpose
0 1 2 3 4 5	timer keyboard slaved to IRQ9 COM2 serial port COM1 serial port LPT2 parallel port	8 9 10 11 12 13	realtime clock redirected IRQ2 reserved reserved reserved coprocessor
6 7	floppy drive controller LPT1 parallel port	14 15	hard drive controller reserved

gram to receive the fax message, and then continues the main program from where it was temporarily

stopped. The entire process takes less time than it takes to read about it, and normally you won't notice

any reduced performance in your program.

On the other hand, if your fax/modem's interrupt is incorrectly set, the modem may not be able to recognize incoming faxes unless you're running a fax program that doesn't require interrupts (for example, a menu-driven program that constantly monitors the phone line to detect incoming calls). The first time you notice that the card is incorrectly configured may be when you upgrade to a new operating system—or when you get calls from customers wondering why your fax machine isn't working.

Besides interrupts, most hardware devices have their own assigned I/O ports: memory locations assigned to transfer data between the computer and hardware device. Some cards have DMA (Direct Memory Access) channels with the ability to read and write to your computer's memory directly. As with IRQs, you should make sure you don't have more than one card set up to use the same location.

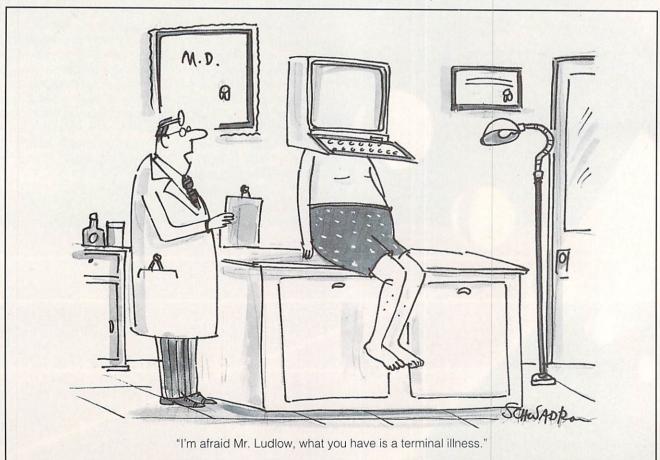
Hard Versus Soft

Another confusing factor is that there are several different types of interrupts. Programs can generate their own software interrupts, and they often use interrupts to call operating system routines.

TSRs (Terminate and Stay Resident programs) are examples of routines that use both hardware and software interrupts. Hitting the proper combination of keys causes a hardware keyboard interrupt. The TSR software uses a software interrupt to temporarily stop your current program and allocate memory space for the TSR routine until it's completed.

An Isolationist Policy

The simplest way to solve hardware interrupt problems is to avoid them in the



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Table 2: Typical Hardware IRQs in an AT-Class Machine

IRQ Status				
IRQ	Address	Description	Detected	Handled By
0	1C67:00AA	timer click	yes	system area
1	1C67:0124	keyboard	yes	system area
2	F000:FF53	second 8259A	yes	BIOS
3	1C67:02A1	COM2, COM4	no	system area
4	1C67:0329	COM1, COM3	yes, as COM1	system area
5	1C67:03B1	LPT2	no	system area
6	1C67:0439	floppy disk	yes	system area
7	0070:0756	LPT1	yes	system area
8	1C67:01A3	realtime clock	yes	system area
9	F000:C0F5	redirected IRQ2	yes	BIOS
10	1C67:04C1	reserved		system area
11	1C67:0549	reserved		system area
12	1C67:05D1	bus mouse	yes	system area
13	F000:C0E6	math coprocessor	yes	BIOS

first place. Whenever you install a new peripheral, write down the device's characteristics and configuration. As a general rule, I include a text file named WHO_AM_I.TXT on each computer I set up, docu-

menting the computer's configuration and each of its peripherals and accessories. I tape a hardcopy of this documentation to the inside of the computer's case for future reference.

When installing a new

device that uses an IRQ, you should check to see which IRQs are available. Table 1 shows the standard interrupt assignments for XT-class (8088) and AT-class (286, 386, and 486, machines. The device pro-

bably has a set of switches or jumpers to select different IRQs. You may also need to configure the device's software drivers to tell it which interrupt you've selected.

But what should you do if you unexpectedly encounter a hardware interrupt problem?

The first rule to remember is that interrupts have different priorities, with lower-numbered interrupts getting higher priorities. For example, if the keyboard (IRQ1) and primary printer (IRQ7) generate simultaneous interrupts, the keyboard gets priority. After it completes its routine, the printer interrupt can be processed. The second major point of confusion is the IRQ2 on an AT-class machine. There is no IRQ2 on an AT-class machine. Anything assigned to IRQ2 is automatically switched to IRQ9.

Internal modem and fax/modem cards are generally designed to emulate

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a standard serial port attached to a modem. Since they look like serial ports to your computer, they're configured as COM ports. You should remember that they must be assigned to an unused port within your system. Higherquality internal modem cards can be configured as COM3 or COM4 to avoid conflicting with the standard COM1 and COM2 ports which may already be installed in your computer.

If you suspect an IRQ conflict, you should run a diagnostic program that displays each of the hardware interrupts and its status (table 2). If the diagnostic program crashes (stops working and refuses to accept any keyboard input), then it's likely that you have two devices set to the same IRQ.

The most obvious source of your IRQ conflict is the most recent change you've made to your computer

(that is, a new hardware peripheral, a new device hooked up to your computer, a new program or driver, and so on). This may be misleading, though. I had accidentally configured my mouse and COM1 serial port to the same IRQ. Both the mouse and a modem hooked up to the COM1 serial port worked normally until I disconnected the modem and hooked up a scanner to the COM1 port. My scanner's software package indicated that it couldn't find the scanner attached to the serial port (a message that was particularly irritating, since the scanner was sitting right there on the desk next to the computer).

The solution didn't seem obvious until I checked the switch settings for the IRQs for the COM1 port and mouse and found that they were both set to IRQ4. Since IRQ4 is the standard location for the COM1 port

(and also for the COM3 port, with IRQ3 being the standard location for the COM2 and COM4 ports), I reset the mouse card to another IRQ. My mouse card has a set of DIP switches to configure the card's address and IRQ, and fortunately, the card had enough documentation to permit easy reconfigurations. After the switch, the scanner software was able to find the serial port and scanner, and everything worked perfectly.

You may have to open up your computer to examine how its ports are configured. If you've never opened up your computer, you should have an expert help you. A small flashlight can be extremely useful for examining switch settings. In general, any ports built into your computer have their setting jumpers or switches on the mother-board, and peripherals have jumpers on their

boards in the expansion bus. In some rare cases, settings are extremely difficult to establish and may require a knife or soldering iron, but almost all peripheral cards use standard switches and jumpers. Some cards include enough documentation printed directly on the board to indicate how the switches or jumpers should be set; others include cryptic labels like J5, and you have to refer to the documentation to determine how to set up the card properly.

Don't Give Up the Chip

Look for interrupt conflicts when you install new peripherals and software and whenever you have a degradation in performance for no obvious reason. Interrupt conflicts are far more common than other sources of computer problems, such as hardware failure or viruses, and are much more easily fixed.

by the game itself.



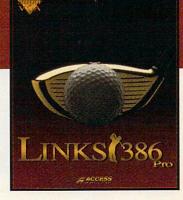
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ART WORKS

Robert Bixby

BITS AND PIECES

I appreciate the time and effort of all those who responded to what I now think of as "the ox column" (COMPUTE, October 1992). There are few issues more central to computing than desktop publishing and few issues of greater concern to desktop publishers than censorship. I think I gave a few readers the mistaken impression that I was speaking out in favor of pornography. In fact, the column made the case that pornography is an inevitable outgrowth of the

umn will recall that my wife and I undertook to typeset and publish a book of memoirs of John Russell Beal, her family patriarch (COMPUTE, May 1992). The letter writer intends to publish a book about the Church of England in the Bahamas and wanted to know what software I used and what book on desktop publishing I would recommend.

I used Ventura Publisher 2.0 to typeset the book. I have a special regard for Ventura over many other products because it leaves the text of your publication in a simple text file

> that can be edited with any word processor or text editor. Its tags are easily inserted from the word processor, allowing you to do all your chores in the lightning-quick environment of a DOS word processor, usually with a simple search and replace. Page-Maker took a giant step forward when it incorporated a simple text editor in the program, but I can do much

more with a word processor than with PageMaker's text editor. Sorry, Aldus; I still prefer venerable old Ventura.

Truthfully, though, since I finished work on the book, word processors have taken so many strides that I believe I'll simply use Ami Pro or Word for Windows to do my next major book project. I publish a small literary magazine partly because of a love of literature and partly to have an excuse to use all the desktop publishing hardware and software that comes my way. I pasted up the last two issues using only Word for Windows and ended up with a very short list of complaints. If all you're doing is a book made up primarily of text (really one of the simpler projects you could undertake), a word processor will probably fill all of your needs. Ami Pro even has an image editor that will let you adjust the brightness and contrast of gray-scale images.

The best book on desktop publishing-and on publishing in general-is The Chicago Manual of Style. It's the manual we use at COMPUTE and the one I use at home. It contains an exhaustive review of all those troubling questions that never arise unless you remember that your work will be in print for everyone to see. But even more important, it has a chapter on assembling a book, section by section.

There are a handful of excellent books on desktop publishing and design, including Roger C. Parker's best-selling Looking Good in Print (Ventana Press).

Another way to make sure you put your book together right is to find a book whose design you admire and emulate it. Most book designers get into the game because they admire the work they've seen on the shelf. As much as a painting or a sculpture, a book can be a real work of art.

Finally, almost as soon as my column on desktop typesetting went to bed (COMPUTE, January 1993), LaserMaster came out with vet another amazing product. Using the brand-new Hewlett-Packard LaserJet 4 as a platform, LaserMaster now produces plain paper typesetting at 1200 dpi. The WinJet 1200 is an add-on for the 600-dpi LaserJet 4 that includes 50 TrueType fonts, a PostScript interpreter, and a superfast video interface. Its price is \$995 (plus the cost of the printer). Call (800) 365-4646 for more information.

As much as a painting or a sculpture, a book can be a real work of art.



same right to free speech that provides our culture with great literature, that you can't have one without the other. and that it is a small price to pay. There are plenty of places in the world where you can risk your life by publishing either great literature or pornography. I, for one, am proud and grateful to live in one of the few nations where tolerance is the law of the land.

On a completely unrelated matter, I received a letter from a woman in the Bahamas asking for more details regarding my wife's grandfather's book. Long-time readers of this col-



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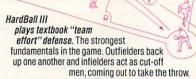
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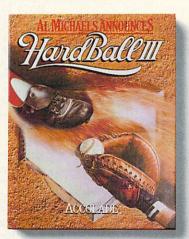
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Unleash your child's creative energies with Storybook Weaver. Thanks to the program's sumptuous graphics, legions of personalities, and suites of sound effects and music, your budding Nobel laureate will be encouraged to create imaginative tales to share with family and friends.

No one could doubt the value of the hands-on creative process; perhaps more significant is the appeal of creating something tangible to show friends, parents, and siblings that declares, "I'm smart," "I'm funny," or "Let me entertain you." Parents love to see children learning to spell as they grapple with language, stimulating their imaginations. MECC has made the experience even more appealing by making it digital, replacing ink and processed pulpwood with your child's new best friend and tutor, your PC.

Young authors have decisions to make right away as they create their title pages. Will they include gingerbread borders or have no borders at all? Using the mouse to point and click through these choices, kids are rewarded with instant pop-up graphics low in resolution but highly colorful.

Next, writers click on empty text blocks to name their stories, type their own names, and comment on their stories if they please. Already, kids have some idea of what direction their work will take—and they haven't even reached page 1 yet! To move forward, authors simply need to click on the page-turning arrows that are located at the bottom



of the screen. But before making that step, they'll probably want to add some music—Storybook Weaver will play music at the beginning and the end of a story if the author commands it.

The program automatically adds pages as kids write, up to the program limit of 50. Each page consists of either text and graphics or only text. In the case of text-and-graphics pages, children select everything from the skyline to the foreground; an open block for words waits at the bottom of the page, ready for input at any time.

To select a background, kids just click on the appropriate image in the tool palette, in this case, Scenery. A new row of thumbnail pictures appears below the composition space; selections range from meadows to mountains, forests to ravines. Storybook Weaver even provides lighting effects: dusk, dawn, day, and night. If nothing seems appropriate for the story in mind, your child can choose from a range of colors to provide the desired background.

With a set stage, the plot

can really begin to thicken. From the tool palette once more, aspiring scribes simply click wherever their hearts take them, from mythical beasts to everyday people and objects. Under the auspices of nature, kids will discover lightning bolts and beaver dams, blazing fires and gusting winds. Clover, cabbages, fields of corn, fruit trees-a whole world of special effects and environmental props stands ready to help tell a new story.

A search through the real-world people brings kids face to face with a cross-cultural melting pot: Asians, Native Americans, Nordic men in Alpine dress—all performing various activities such as climbing, walking, and sleeping. Boys and girls fill the ranks too; kids will have plenty of virtual friends to identify with here.

Where shall all these people live? How about a sinister castle or a gingerbread house? Maybe Baba Yaga would enjoy the move from a dancing hut on chicken legs to an ornate pagoda. Would that lighten her mood? Possi-

bly, and if that thought occurs to your child, then Storybook Weaver does more than just act as palette; it interacts, provoking thought.

What's more, Storybook Weaver introduces children to Russian folklore and Native American mythology, among other, often previously unexplored, realms. And the fantastic creatures that MECC threw into the mix here will set young minds racing and perhaps a few future copy editors or history professors running to the encyclopedias to do some research.

Storybook Weaver allows as many as 50 objects on a single page-more than enough to obscure even the most lavish backgrounds. Giants, already towering over normal men, meet their match in babies that grow a dozen times over. Authors can manipulate object characteristics with ease from the tool palette. They need only click on an object to select it and then choose from shrink



Stories come to life onscreen.

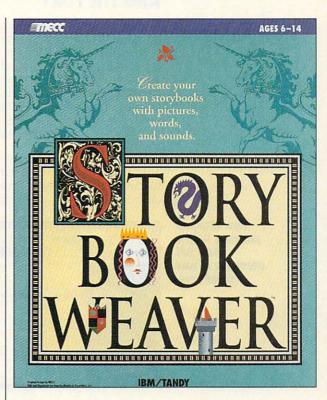
and expand options, flip (to flip the object horizontally), color (to change skin or clothing hues), and sounds (to add sound effects). Sound effects range from clangs to whistles, car horns and screeching tires to bird calls and footsteps. To move objects around the screen, the visual artist just clicks, holds, and drags.

ters a menu bar at some point in life, and Storybook Weaver makes the experience simple for first-timers. Authors can click once to activate a menu and then click twice on an option to activate it. Here, they may alter the story text from plain to bold or italic; open, close, or save files; or request help on any aspect of the program.

Under the Goodies menu, kids find more ways to change object attributes (should an object the reader clicks on always cover other objects it touches?) and the way to insert and delete story pages. The choices that are available from the menu bar are neither numerous enough to intimidate a youthful novice nor in the least bit obscure: Everything works exactly as its label implies. Best of all, if your kids run into trouble spelling the name of an object, Storybook Weaver will actually drop the word's correct spelling into the text of the story. Budding writers can find everything they need to pull together perfect fictions in a single package.

And for those children who want to give their stories to grandparents and others, Storybook Weaver supports a gamut of printers. Output is understandably a bit hazy on standard, noncolor printouts; the best dithering remains only gray scale, after all. Thoughtfully provided markers make the difference though. And after completing a story, kids can print it and then bind it just as in the old days-with string and staples.

What has MECC left out here? Unless your friends own a copy of Storybook Weaver, your children can't Every computist encoun- swap stories on disk. Each



saved file requires only a few thousand bytes of hard drive space: the images and music files already reside on the drive so the actual story file can be quite brief. Also, kids might want to compose their own melodies or draw their own dragons. At present, the program limits them to the data on file-a prodigious amount of data, to be sure, but ultimately finite. Suggestions? Well, how about some inexpensive expansion sets?

In the meantime, your kids probably won't complain as they add wings to babies and put giraffes in pickup trucks. Every image complements every other image here, and even after spending weeks with Storybook Weaver, young writers will still mix and match with surprising results.

Circle Reader Service Number 392

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MULTIMEDIA PC

David English

THE SOUND AND THE FURY

Ever since Microsoft brought sound to Windows, there has been an explosion in Windows-based audio products. Sound cards are selling as fast as stores can get them in, and 16-bit sampling cards—the ones with CD-quality audio—are quickly becoming the standard.

Software companies are reacting just as Hollywood did following the success of *The Jazz Singer* in 1927—sound is

North by Northwest), and musical instruments from around the world. You can buy five similar packages from Sound Source Unlimited (2985 East Hillcrest Drive, Suite A. Westlake Village, California 91362; 800-877-4778). Sound Source currently offers two "Star Trek" packages (\$59.95 each), two "Star Trek: The Next Generation" packages (\$69.95 each), and one 2001: A Space Odyssey package (\$69.95). Three packages of sounds from the Star Wars movies will be available soon.

In all these packages, you'll

find sounds appropriate for specific Windows system events. For example. you could have Windows start each time with Captain Picard saying to you, "Welcome aboard." or have Windows exit with Carv

Grant saying, "I've had enough stimulation for one day." I especially like the "Star Trek: The Next Generation" computer and communications sounds because they're less intrusive than the usual dialogue-based sounds.

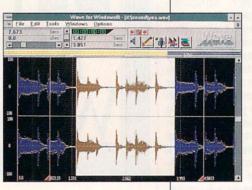
Almost all sound cards come with software that lets you create your own sound files. But if you're interested in recording, editing, and manipulating sounds with professional-quality tools, you'll want to check out three new Windows sound programs. If you're looking for the best set of editing tools, your best bet is WAVE for Windows (Turtle Beach Systems, Cyber Center #33, 1600 Pennsylvania Avenue, York, Pennsylvania 17404; 717-843-6916; \$149). WAVE includes a full undo, a fascinating 3-D visual analysis of your sound file, time compression and expansion, volume adjustment of all or any part of your sound file, and four-band digital equalization. Despite the elaborate tools, WAVE is easy to use. Turtle Beach has been selling a similar recording-and-editing system to professional musicians for years and clearly knows how to turn your PC into a powerful recording studio.

The other two programs are Sound Impressions (DigiVox, 991 Commercial Street, Palo Alto, California 94303; 415-494-6200; \$149.00) and MCS Stereo (Animotion Development, 3720 Fourth Avenue South, Suite 205, Birmingham, Alabama 35222; 205-591-5715; \$79.95). While they don't have the editing savvy of WAVE for Windows, they make up for it by offering a solid group of features for Windows audio, MIDI, and audio-CD. Both model themselves on a home component-stereo system. Both offer a WAVEformat recorder-and-playback system that looks like a cassette recorder, a CD-ROM playback system that looks like a standard audio-CD player, a MIDI playback system that looks like a digital recorder, and a mixing panel that lets you set the input and output levels for the other three components.

Both programs are well designed, though I would have to give the edge to Sound Impressions for its ease in loading individual files and its special editing features. MCS Stereo is a little easier to learn, but currently has conflicts with Adobe Type Manager and Squeegee.

Look for even more audioware throughout 1993 and for sound-card circuitry to be built into many PC motherboards. As Al Jolson said in *The Jazz Singer*, "You ain't heard nothin' yet!"

New Windows programs let you take full advantage of your sound card.



being added to everything in sight, whether it needs it or not. You can buy talking icons, talking clocks, and even talking solitaire games.

One fast-growing category of audioware lets you attach sounds to your Windows system events. These events can include Windows open, Windows close, default beep, critical stop, application open, and control panel minimize. A good place to begin with this kind of software is with one of the SoundBits collections (Microsoft, One Microsoft Way, Redmond, Washington 98052; 206-882-8080; \$39.95 each). The three current collections consist of Hanna-Barbera cartoon sounds (including the Flintstones, the Jetsons, and Yogi Bear), movies (including The Wizard of Oz, The Maltese Falcon, and



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Alfred Giovetti

THEATRE OF WAR

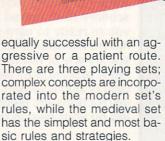
Get ready to play a game like no other. One that demands such fast reflexes that it puts some arcade games to shame; one that requires the intense strategy and forethought of the most heated chess game. Get ready for Theatre of War, a game so unusual that it's difficult to understand unless you actually play it.

With Theatre of War, Three-Sixty pushes the envelope of computer strategy games, using the full capacity and power of the newer, faster computers equipped with hires 640 × 480 SVGA graphics and voice-capable sound cards

cards.

It's a visual and aural feast. Its musical algorithm composes variations on a variety of preset jazz themes, synchronizing the music to the ebb and flow of the battling pieces. Accompanying the music is a high-quality, digitized vocal part that comments on and embellishes game functions. The pieces themselves-abstract raytraced, 3-D forms rendered in bright, clear colors, using the full 256-color palette-spin and glide their way across the board like ballet dancers or ice skaters in free-form competition.

On the surface, Theatre of War is like chess. The ultimate goal parallels the chesslike kill-the-king idea. It has simple rules that can be learned quickly; but gameplay is complex, with the capacity to provide an infinite variety of subtle moves and countermoves. Strategy is based on the personality of the game player; players can be



The stage is a cyberspace, represented by a matrix of squares that can be varied from the 8-× 8-square pattern of the familiar chessboard to a 50-× 50-square battlefield. The board can be displayed in overhead view, end-of-board oblique view, or as a series of checkered hills. The squares' colors and textures reveal terrain features that affect movement, endurance, and combat effectiveness.

Surrounding the board are various icon-based controls and display features. The 30 increasingly difficult scenarios provided will be supplemented by the future production of a scenario editor, new play sets, additional scenarios, and a network-play option.

Within the cyberspace, your 16 abstract, bright-blue shapes are poised on one side of a checkered battlefield. Facing them is an army of red shapes. Observing the

battle from your control monitors, you must be a quick-acting general, sending your troops racing across the board, while the monitor speakers blare a continuous stream of jazz music. The tempo of the music increases as a line of red soldiers glides across the board in the direction of your blue line. As the reds near your line, your soldiers move out to meet them, executing your commands. The convincing sound of explosions punctuates the action, and various pieces speak, relating their status.

The game's three playing sets are medieval, Great War, and contemporary. Each set is composed of 16 pieces of six different types, with up to six separate functions per piece. Each set has a commanding kinglike piece with certain healing and authority-based powers. Other pieces serve the roles of infantry, artillery, cavalry, and fire support. Each set has its own strengths and weaknesses.

Both chess and Theatre of War are abstract strategy games that simulate warfare, but Theatre of War provides



some advantages over the ancient board game. Combat is conducted in realtime (save in the two-player, one-computer mode, in which players take turns), and it presents a challenge in the placement and deployment of troops as well as in effectively using and conserving the troops' expendable resources. Therefore, the conflict addresses both strategy and tactics.

As the leader, you can give any number of commands to any number of pieces; you're limited only by the time it takes to point and click. The pieces do the rest, executing your commands automatically. The realtime play makes the game more realistic than the rounded (you take a turn, I take a turn) play. It also emphasizes fast action and quick reflexes.

Learning the names and functions of the pieces in the sets was an enjoyable experience on its own. The highly intuitive interface almost makes the well-written instruction manual and command cards superfluous. The sittingduck scenarios provide an experimental battlefield that allows you to learn the pieces' functions without being blown up. After you've investigated with the mouse, the functions of each piece and command tile are revealed. Before you know it, you're playing the game with ease.

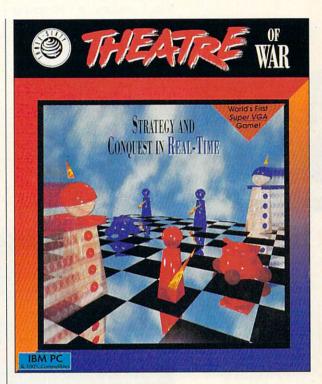
Theatre of War allows three modes of play: one-man show, human versus computer, or two-player. You can use human-to-human combat on a single computer or in realtime over a null or phone modem.

The different methods of play involve different strategies. The rounded play of twoplayer, one-computer mode gives the player with the first move an initial advantage. Modem and one-player play are in true realtime; your strategy will require you to choose between the advantages and disadvantages of the various modes of piece display and board display, and piece status will also be important.

The pieces were designed in 3-D; then they were raytraced, using 3-D software. The images were compressed to fit more easily on the disks. Three to six animations were prepared per piece for Fighting, Moving, Dying, Special fighting, In-trouble, and Protected modes. Traditional paperand-pencil animation drawings enhance the ray-traced animations. The transparencies and reflections of ray-tracing combine with the flat animations to create a smooth flow of texture and form. The bright. transparent, primary colors of red and blue are set off by the ray-traced, veined marble of the board and the iconbased controls.

Digitized speech and music have the dual effect of both setting and following the tempo of the game. Humor has been interiected into the largely somber mood of the game to remind you that Theatre of War is, at its heart, just a game. The script gives the pieces personality as they say, "I am too tired" or "I am dead." The voice replaces the need for a text-based warning window and enhances the play significantly for those whose hearing is not impaired.

Theatre of War's games are designed to be completed in one sitting, obviating the need for a save-game feature; however, you can pause the game in the single-player



mode or in the two-player, one-computer mode. The developers expect modem play to be the most satisfactory, in spite of early indications that solitaire play seems to be the most popular.

The designers have taken the war-game expertise that made Harpoon such a hit and have created an abstract game of strategy and tactics that not only challenges the intellect in three different eras of military history but also is a feast for the eyes and ears. The bright, crisp colors, detailed 3-D graphics, online composition of synthesized jazz, digital voice, and intuitive, interactive interface leave little to be desired. Theatre of War is a well-thoughtout abstraction of war-a game that may rival chess's power to entertain.

Circle Reader Service Number 393

IBM PC or compatible (80286 compatible required, 80386 compatible or faster recommended); 640K RAM for 256-color VGA, 2MB RAM for SVGA with 256K on the video card; hard drive; DOS 5.0 and mouse highly recommended; supports Ad Lib, Sound Blaster, and Sound Blaster Pro—\$49.95

THREE-SIXTY PACIFIC Distributed by Electronic Arts P.O. Box 7530 San Mateo, CA 94403-7530 (800) 245-4525 (orders) (408) 879-9144 (Information)

GAMEPLAY

Paul C. Schuytema

THE LONG MARCH

What makes a computer game a classic? Is it longevity? Originality? Mass appeal? It could be any or all of these things, but one thing is certain in the world of computer entertainment: A classic is not a classic because it has remained stagnant.

Take The Oregon Trail by MECC. The game has been around forever (in terms of PCs, that means since the Apple II in 1979), and it's still here. The task is simple (or so it first seems): to guide a wag-

ries, just what it might have been like. The Oregon Trail is not the same game it was. It has just moved to 256-color VGA and full mouse support, and during its evolution. The Oregon Trail has become a better game. Now, when you hunt, you must actually aim your weapon, lead the prey, and shoot carefully (you brought along only so many bullets, remember?). If and when you get to the Columbia River, you must navigate it yourself, avoiding rocks and swirling eddies.

Accolade's sports game

from the mid 1980s, Hard-ball, is another game that has stood the test of time. The baseballsimulator began with CGA graphics and a simple premise: to simulate the feel of full-diamond baseball, from play to man-

agement. The current incarnation is Hardball III, which is announced by a digital Al Michaels and features woodgrain scoreboards, customizable players, rosters, and zoomed-in shots of key plays. Accolade has also just released the MLBPA Players Disk, which allows you to play real teams in Hardball III.

One category of games that faded from view during the graphic revolution is the text adventure. Beginning with the original Adventure at MIT, the genre grew into interactive fiction. In 1982, Zork I, Infocom's first interactive story set in the Great Underground Empire, was the top-selling computer game. Infocom tackled nearly all genres, from the hard-boiled detective story in Witness to cryogenic science fiction in Suspend-

ed to tropical diving adventures in Cutthroats—all without a single screen of graphics.

Not many games have yet come up to the storytelling depth of Infocom's adventures. So Activision has rereleased a two-volume set containing Infocom's 31 classic stories of interactive fiction. There are enough games in those two heavy boxes to keep even the most expert player challenged for years.

Back in the early days of computerized entertainment, games like Adventure and Zork were the first to take us to other worlds: fantasy worlds. There is a tradition of fantasy role-playing that is every bit as long as computer gaming itself, and one of the most stunningly evolved and dynamic series is Origin's Ultima. The first trilogy still sells well, and it should: The adventures are addictively playable.

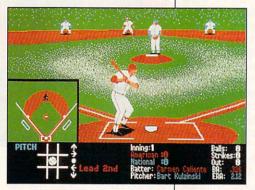
The first Ultima adventure was released in 1980, utilizing tile graphics: It was a bird's-eye view of the lay of the land with the hero at the center. The Ultima trilogy (Ultima I, II, and III) takes place in the kingdom of Sosaria, ruled by the benevolent Lord British. Sosaria is a world full of castles and dungeons and creatures of every flavor, and exploring is the name of the game.

Currently, the series takes place in Britannia and has progressed into Ultima VII, Ultima VII Part Two (Serpent Isle), and Ultima Underworld: the Stygian Abyss. The graphics have pushed the technology to the edge (Ultima I requires a PC with 256K RAM and EGA, while the Stygian Abyss needs a 386 with 2MB of RAM and VGA), but the story is still the thing. And Ultima delivers.

Perhaps the acid test for a classic (no matter how old) is this: Do you still ponder the game after you shut off the computer and walk away?



The only way to tell whether a game designer is working on a classic is to check the gameplay. All the graphics in the world won't make up for leaden play.





on from Independence, Missouri, to the Willamette Valley in Oregon during the 1840s. It's a logistical game: You have to know what supplies are important from the start, and you have to keep your people fed and healthy. What the game accomplishes beyond just great gameplay is to make you think about the millions of variables and unknowns the settlers had to face during that trek of 2000+ miles. You learn along the way, by listening to complaints and hopes and histo-

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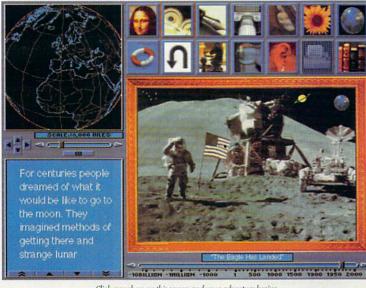
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TOBOLY GO

BY PAUL C. SCHUYTEMA

While it seems as if it's been around forever, the original "Star Trek" televi-sion series never came close to finishing its fiveyear mission. Now, 25 years after the first episodes on that cardboard and primary-color set, we have the chance to return to the helm of the Enterprise and experience the fourth year of exploration and wonder. But this time, instead of living vicariously through the actions of one James T. Kirk, we have the opportunity to be Kirk. Interplay Productions' Star Trek: 25th Anniversary gives us the chance to sit in that Naugahyde center chair, lean hard into the

turns of a mighty starship, and experience seven episodes of the continuing voyages of the starship Enterprise.

Hero Without a Name Interplay's Star Trek is lovingly faithful to the look and feel of the original television series. The game is played in episodes which have the same sense of closure as the original episodes. And we have the opportunity, as Kirk, to continue our work with our trusted colleagues at our side: Spock, Bones, Scotty, Chekov, Sulu, Uhura, and, of course, the nameless postadolescent security guard dressed in a red velour top.

Bruce Schlickbernd, Star Trek's producer, wanted a game with the episod ic look and feel of the television series. Star Trek is a precious commodity, one that Paramount guards tently referred to Bones by carefully, and Paramount spends a great deal of energy making sure that the myriad of Star Trek products remain true to the Star Trek mythos. Bruce's team would run its scripts and videotapes past Paramount for approval for each episode. There was never really any major conflict between the game's development and Paramount's Star Trek universe. Most of the corrections, Bruce told me, were details that need-

ed to be ironed out. In one episode, Paramount felt that the shields of the Enterprise were weaker than they should be, and in another, a writer inadverhis given name, not his quintessential nickname.

Bruce told me that Paramount did set some limits as to what Interplay could not do. The Klingon home world was off-limits, for example, because a future "Next Generation" episode was going to be dealing with that. Also, the planet Vulcan was off-limits-but that still left Interplay with a lot of Federation real estate to explore.

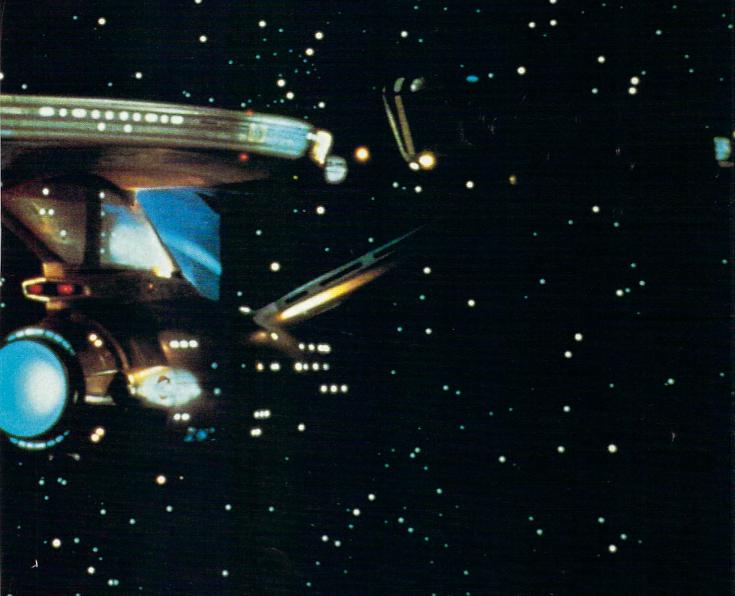
When I asked Bruce

what he considered the most enjoyable facet of working on the game, he told me that it was the characters. The original "Star Trek" was built on the foundation of the bridge crew, and it was their interaction as much as their individuality that made the fantasy seem real. For Bruce, getting the characters right was the major victory. After that, he said, "the episodes would almost write themselves."

The characters do seem * alive in this game. Spock and Bones trade verbal barbs, and that no-name security guard always has some down-on-the-farm innocence to bring to light.

Also, each episode ends with the familiar bridge banter and a cerebral observation by Kirk. The first episode of Interplay's Star Trek is Demon World, and the story is slightly reminiscent of the sciencefiction movie classic Forbidden Planet. Kirk sums it all up by stating, "We all have demons of our own, Bones. The ones that we can't confront are often the hardest to deal with."

When I asked Bruce what his crew did to research the game, his reply was immediate. "Oh, that's easy. Just watch 'Star Trek' endlessly." And what bits and pieces did they glean from their Trek-



fests? For one thing, the color of the *Enterprise*'s phasers and photon torpedoes changes. Bruce explained that the first episode to feature really heavy space combat was episode 11, The Balance of Terror. In that episode, the *Enterprise* used blue phasers and red torpedoes to battle a Romulan Bird of Prey. But by the 16th episode, the colors had been reversed.

Mudd in the Shadows

One of the interesting development snafus came near the end of the design process, according to Bruce. The character of Harry Mudd was well rendered and looked just like the Mudd in the television series. But Paramount insists that all detailed character art must be approved by the actor or actress who played the role, and the actor who originally played Mudd had passed away. There was no time to go through the lengthy channels of approval. The solution? The dialogue was tweaked a little, and the designers placed Mudd in shadows, obscuring the carefully rendered details of his character. But it's still Mudd-and he's a character who should be lurking in the shadows anyway.

It would be hard to classify the Star Trek game. It's not really a spacecombat simulator, though skill in space combat plays a vital role. It's not a true role-playing game because you are bound to the conventions of the established characters (one of them being that if either Kirk, Bones, or Spock dies, the game is over). It's a sort of hybrid that is extremely playable, and what makes the game so playable is the episodic format. We focus on a very specific mission, and since all of the puzzles and challenges relate to the ultimate goal of the episode, it's very easy to stay edge-of-your-seat involved.

The game basically takes place on the bridge or with the actions of an away team featuring Kirk, Spock, and Bones (as well as the security officer-what was his name?). The bridge feels like a set right out of the television series, but with one major exception: Most of the blinking lights and bars of color actually mean something. Spock leans over his mysterious periscopelike scanner, and Uhura holds the receiver to her ear for better reception. We have control, through Sulu and Chekov, of shields, weapons, and navigation, and we can even order Sulu to "increase magnification," just as in the series. In the game. Scotty is on the bridge (he was there sometimes during the series), manning the engineering, furiously repairing damaged systems, bringing up emergency power, and chortling lovingly that Romulan ale will never beat a good Scotch.

One of the most entertaining aspects of the game is the ship-to-ship combat. In the original series, the battles were often a means to an end, but in Interplay's Star Trek, we have control of the helm. Kirk controls the phasers and photon torpedoes (though, ostensibly, through Chekov). We maneuver the ship, control the impulse engines, roll the *Enterprise*, and bark repair priorities to Scotty. The battles can get furious, and if Kirk isn't up to snuff, the *Enterprise* explodes in a tumbling ball of flames.

To prepare Kirk for the battles, every time the game begins, the Enterprise must duke it out in simulated combat with the Federation ship Republic. Do well, and the Republic's captain sends congratulations. Do poorly, and Kirk shouts, "It's only a simulation!"

When the away team beams planetside, we have the familiar array of equipment at our disposal: scientific tricorder, Bones's weird little medical wonder, communicator, and phaser (with stun and disintegrate settings). Through an ingenious icon-driven command system, Kirk can use any of the capabilities of his crew, as well as converse, manipulate objects, and pick up items.

While it's always important to remember the Federation's Prime Directive and to recognize that Kirk is a servant of Starfleet, it's nice to see that he still has a bit of the cowboy left in him. His banter can be as crass as we remember, and he slings his phaser more like Jesse James than a dignified Starfleet captain.

Back to the Future

The graphics in Interplay's Star Trek are superb. The colors are bright and overvibrant (just as in the television series), and the scientific gizmos (accelerators, synthesizers, and so forth) all look wonderfully mysterious and gadgety. When a foe stumbles back from a phaser blast, the animation is realistic and properly theatrical. Even the wounded seem to convalesce at that odd angle (up on one arm) that was so peculiar in the original series.

One of my favorite features of the Star Trek series (both the original and "Star Trek: The Next Generation") is the characters' serious attitude toward science. I don't mean real science, because most of the science in either series is hokum; but it's taken with a great deal of seriousness, as if it were real and true in their world. And

Interplay's Star Trek maintains this tradition. It would have been easy to gloss over the litany of scientific terms that were so colorful in the series, but Interplay didn't. You can access medical databases to learn how to synthesize TLTDH gas, laughing gas for Romulans and Vulcans (their physiology is similar, remember?). You can use a cryptic and mysterious tool to repair a broken transporter, only after you jury-rig a "comb bit."

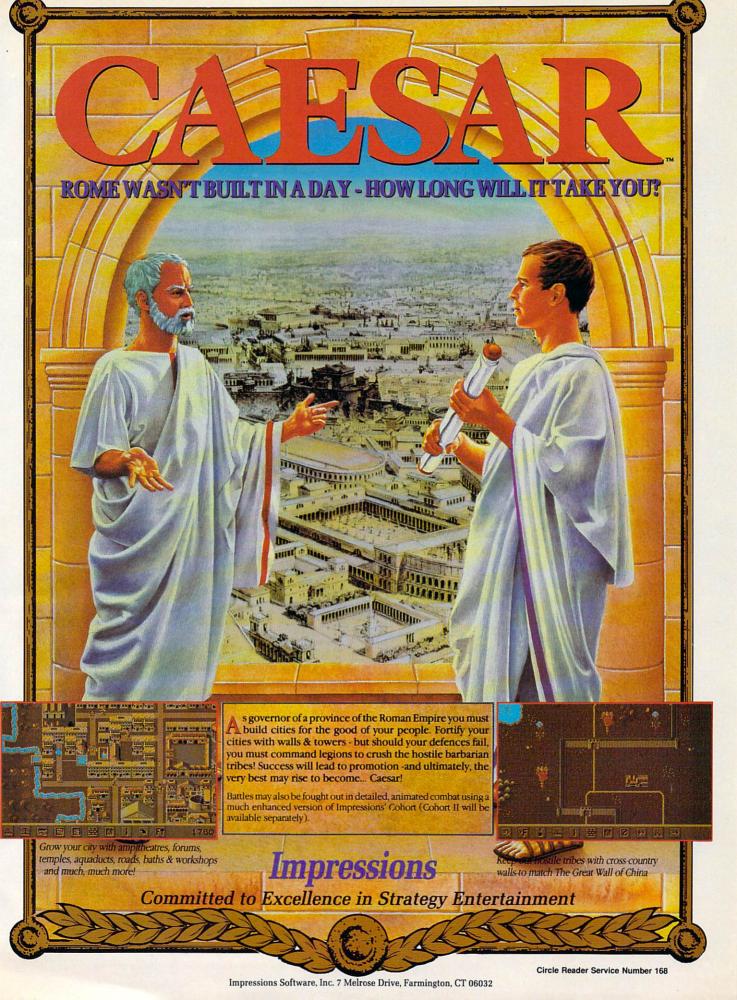
One of the hardest design tasks is to create new adventures in such a familiar universe. Paramount has made sure the universe is solid and consistent while allowing Interplay to be wonderfully creative in its scripting. These episodes are at once familiar and all new. Familiar because the fabric of the original "Star Trek" series remains intact, and all new because the challenges are fresh and exciting.

The game can be played in comfortable chunks, thanks to the episodic design, and you can save the game at any time. The entire game should take a player around sixty hours to complete, but there's no rush, since there's plenty to look at and interact with. Interplay designed the game for a Star Trek enthusiast, but not necessarily a Trekkie (though Bruce did admit to putting in a few extra goodies that will be apparent to Trekkies' eyes only).

Outside of Time

So what's the future of Star Trek? I'm sure that it will still be vibrant after another 25 years. Spectrum HoloByte is working on an interactive entertainment center based on "Star Trek: The Next Generation." There is Task Force's strategy board game, Star Fleet Battles, and, of course, you can find Star Trek letterhead at any Trekkie convention. But what about Star Trek for our personal computers? We can now experience Star Trek as a screen saver (available from Berkeley Systems) and hear the voice of Spock coming through our sound boards. Bruce told me that Interplay has just signed a contract with Paramount for a continuing series of Star Trek games based on the original series, and while he couldn't give me specifics, he told me that a new adventure game is just over the horizon.

Like the Republic serials and Hal Roach's Our Gang comedies, Star Trek has become lodged in our culture, to be enjoyed through the generations. It may still be with us when real science has surpassed the fictional science of the Starfleet world. The catch phrase for Star Trek is truly "Live long and prosper."





64/128 VIEW

Can't find a distributor for the great 64 software you've written? Maybe Mad Man can help.

Tom Netsel

ast July in this column, I mentioned a major new adventure game for the 64 called Messiah III. It's a product of a group of programmers and artists who go by the name of Mad Man Software.

When I last talked with chief madman Gene Barker, he said we should expect to see Messiah in the spring. Finding a national distributor has been tough, however. Major software companies are not exactly thrilled to add a 64 game to their list of inventories, so Barker decided Mad Man would handle its own distribution.

Meanwhile, other independent programmers have been contacting Barker about distributing their products. Reluctantly, Barker has had to refuse. He knows how difficult it can be for an individual to find a distributor because his own company was having doors slammed in its corporate face.

Blocked by the distribution hurdle, many programmers release their products as shareware and hope for the best. Barker says that 90 percent of the people who use shareware don't pay for it, and that's no way to encourage new products.

To help his own company and to attract talented programmers back to the 64 platform, Barker has set up Independent Author Service as a new division of Mad Man Software. This service is designed to help programmers get their products to market. IAS offers disk and manual duplication, low-level software theft protection, copyright processing, marketing, and distribution.

In this arrangement, Mad

Man is the product's distributor. The author is solely responsible for content and user support. Mad Man will have an exclusive distribution right for a period of one year. After that time, the author may continue with Mad Man or go on his own.

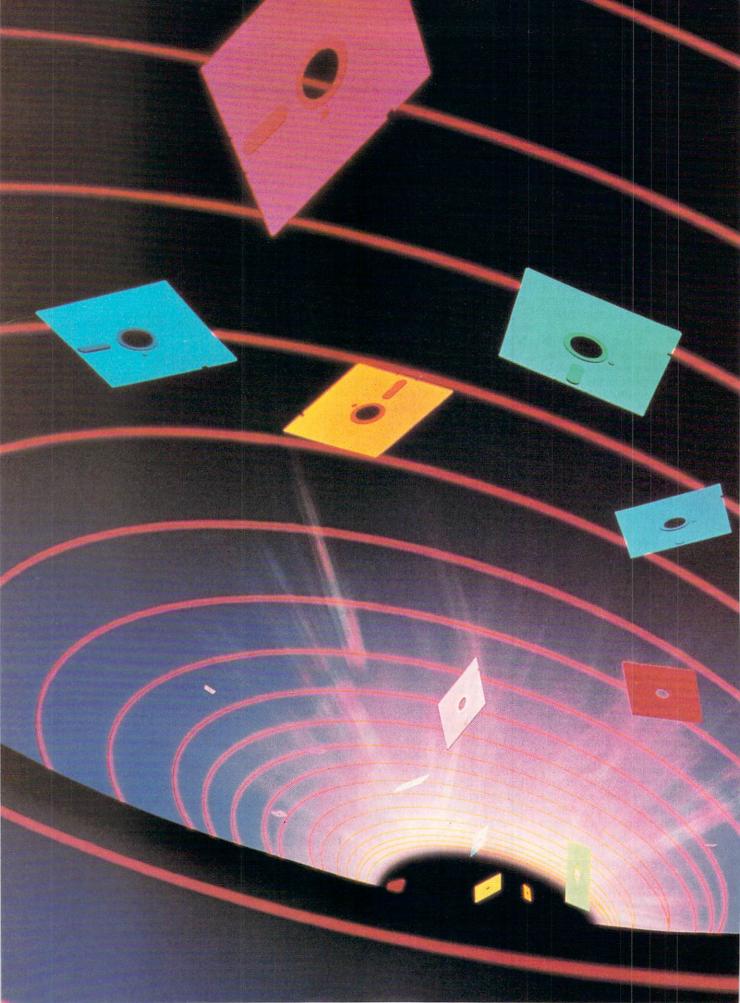
Mad Man will run selected software through its quality control department for fine-tuning and polishing. The author then gets a percentage of the profits resulting from the sale of the product. That percentage is negotiable, depending on how much polishing Mad Man has to do to make the product marketable. Best of all, the service has no up-front fees. If Mad Man accepts a product, it'll also accept some of the financial risk in getting it to market.

"Our goal is to promote authors to the best of our abilities, because their success directly leads to our success," Barker explains. "With some extra work by our existing staff, we can provide authors with services that have taken us years to develop."

Mad Man has put together an Independent Author Kit that contains everything a programmer needs to know about Mad Man's service. You can get a kit by writing to Independent Author Service, Mad Man Software, Enterprise Center, 1400 East College Drive, Cheyene, Wyoming 82007.

It's encouraging to see a company such as Mad Man offering its help to talented programmers, and I wish the venture luck. Success will benefit all of us who want to see new products for the 64.

GAZETTE G-1 64/128 VIEW Here's help for programmers looking for a distributor. By Tom Netsel. G-2 DISKS, DRIVES, AND DISASTERS Save your disks from corruption or destruction. By Calvin Guild. G-8 REVIEWS Easy Books-1. **WORLD VIEW** G-12 The Commodore scene in Australia. By John Buckingham. G-14 FEEDBACK Questions, answers, and comments. G-16 BEGINNER BASIC Take a new look at FOR-NEXT. By Larry Cotton. G-18 MACHINE LANGUAGE Put an undocumented opcode to work. By Jim Butterfield. G-20 PROGRAMMER'S PAGE Here are opcodes the manuals never discuss. By Randy Thompson. G-22 GEOS Put four drives to work with GEOS. By Steve Vander Ark. G-24 D'IVERSIONS What if home appliances go berserk? By Fred D'Ignazio. PROGRAMS G-25 Umbrellas (64) G-27 Stepman (128) G-29 Powersprite (64) G-32 Math-A-Thon (64) G-34 Xinput (64) Spiral (128) G-36 G-38 MLX (64)



DISKS, DRIVES, AND DISASTER

Losing important computer data or programs can be a traumatic experience. Here are some tips to help you prevent data loss, corruption, and destruction.

Because I'm a librarian for a computer user group in Houston, Texas, a large number of floppy disks pass through my drives. As most user groups do, we exchange computer disks and maintain a large library of public domain computer programs.

What with all this activity, we've come across a number of hardware and software practices that are useful in protecting computer data and programs from loss, corruption, and destruction. This article is a collection of those tips, recommendations, and suggestions regarding storage devices and magnetic media.

Cooling Fans

Heat is the greatest enemy of electronic components, and all electronic equipment—disk drives included—must be kept cool in order to work properly. Different types of drives have different cooling needs because of their design and the heat sinks that are provided by the manufacturer, but they all benefit from an adequate supply of moving air.

The 1541-II disk drive solves part of the heat problem by using an external power supply. I have seen old 1541 drives get hot enough to affect their operation. These older models should definitely have a fan

CALVIN C. GUILD

that pulls air through the drive mechanism.

Early Micro-Systems Development drives, SD-1 and SD-2, suffer degraded operation in hot rooms or where cooling is bad. The drives get very hot to the touch and need space for air circulation. Later drives from this company, however, are some of the best hot operation drives around. Our user group has several SD-2 drives, and they perform well in the hot Houston weather, even in buildings that lack air conditioning.

For the 1571 and 1581 drives, I recommend a small personal fan to maintain adequate cooling. As with all electronic equipment, you should plan your setup to include space around the drive to provide air circulation

Raising the drive above the working surface is an effective way to provide more air circulation. At one time, many of our user group members placed their drives on top of small plastic storage baskets. These raised the drives three or four inches above the desk and provided for extra air circulation below the drive.

Avoid the habit of laying disks on top of your drive. For one thing, this practice interferes with the drive's

cooling, but it should especially be avoided because the drive can get hot enough to damage disks or data.

Head-cleaning Kits

There is considerable disagreement over the usefulness of head-cleaning kits. These include dry systems that have a special disk that you run in your drive as if it were a data disk. This procedure cleans your disk drive heads of dust and debris. There are also wet systems which use a cleaning disk that's covered with an absorbent material. A solvent is added to the surface to aid in the cleaning action.

I have used both types of kits. I usually use them whenever I start to get error messages that disks will not load or read data correctly. Using them usually returns the drive to operation.

These kits do work, but they may introduce contaminants into the drive. If excessive fluid from a wet system gets onto a disk surface, it can destroy the surface and ruin data.

If you use the dry system extensively, it can damage the read heads through abrasion. In one drive that I examined, the interior was very dirty because of the accumulation of solvent from a cleaning disk.

Head-cleaning kits should be used sparingly. The preferred procedure is to open the drive and clean the heads manually. While the case is open, you can lubricate the drive assembly, which is important for proper operation.

Head-cleaning kits can be useful, but using them too often can damage your disks or drive. Try one if your drive won't load or save properly. It may prove to be a quick fix. It won't help, of course, if your drive head is out of alignment and needs proper maintenance.

Disk Ratings

SD, DD, and HD are abbreviations for single-density, double-density, and highdensity. These terms are used to indicate the size of the magnetic particles used in the sensitive coating on a magnetic disk. HD disks have smaller magnetic particles than SD or DD disks. The smaller particles produce a lower magnetic field; therefore, drives for HD disks require more sensitive heads to handle the lower voltages generated when reading the disks.

Commodore drives generally work best with DD disks. In our experience, however, no problems have been definitely linked to the use of SD disks. The 1571 drive is a sensitive drive and can often read disks that a 1541 can't read. Our user group has encountered several cases where a 1541 drive could not read data from an HD disk, although a 1571 drive could read the same disk. Naturally, older drives with alignment, speed, or other data-reading difficulties are more prone to read errors when attempting to read HD

You may come across preformatted disks, but these aren't usable in Com-

modore drives. Available preformatted disks use a format that's not compatible with the 64 or 128.

Flippy Disks

Many Commodore users know they can use both sides of what's normally thought of as a single-sided (SS) disk. Because you can flip these disks over and use the reverse side, they're often called flippy disks or simply flippies.

Many of our user group members regularly use flippy disks with their single-head drives. When disks were much more expensive, our 51/4-inch disk library collection was saved on flippy disks.

A flippy is made by cutting or punching a write-enable notch in the disk so that it can be flipped over and inserted in the drive as if it were a double-sided (DS) disk. The notch is cut on the side opposite the disk's normal notch. It can be cut by using a regular disk as a template. Any paper puncher can be used, but a disk puncher can be purchased to place a neat square notch in the correct place.

The nap of the mat inside a disk is generally designed for only one direction of rotation so that it cleans the disk surface of any dust or other small particles. Flippies, being inserted upside down, rotate in the opposite direction. Rotating the wrong way can supposedly release accumulated dirt and debris.

We have used flippies for six or seven years with no problems. There have been no known instances of disk read errors or other failures that indicate that the back side of the disk used as a flippy is any less reliable than the front side. Some failures do appear, but they can occur on either side. There's no indication that the use of flippies is the cause. (See the sidebar "The Flip Side at 3M.")

This observation applies to home computer or amateur usage. In commercial applications, it may be prudent not to use flippies, but most commercial users generally use double-head drives anyway. Some users regularly discard used disks to avoid the occasional disk problem that may occur. For home use, however, any reduction in life or efficiency caused by using flippy disks is very small.

Commercial software producers often use flippy disks for their software. They may supply a program for one computer on the front side and the same program converted for use on another computer on the back side.

Disks designated SS and DS can both be used as flippy disks. For SS disks, only one side of the disk is certified, but we've found that certification doesn't seem to be necessary. Few disks have been found to contain errors due to manufacturing. The errors that have occurred have been on either side, showing little regard for certification.

The most common errors have been a result of physical abuse, such as bending, finger marks, or scratches on the disk surface. A number of disks have also become warped from heat or pressure. Pressure problems can occur when disks are piled flat in a box.

Disks can also suffer in the mail. The weight from other packages and letters can compress the disk envelope, making it difficult for the disk to spin. This problem can often be remedied by gently prying up the folded-over corners of the disk.

Backup Disk Copies

Most problems associated with home computer software, hardware, or

Beware the Magnetic Monster

It's pleasant being near someone who has a magnetic personality. On the other hand, magnetism is something computer disks should avoid like a vampire avoids sunburn. The merest hint of a magnetic field can destroy the data on a valuable computer disk. Or can it?

Just how much magnetism is too much? We've all heard about the secretary who keeps data disks stuck to the side of a filing cabinet with a magnet. How can some people get away with such stunts when a ringing telephone will erase anything on a disk that's within two feet of it? Or will it?

The National Bureau of Standards recently conducted a variety of experiments to determine just how much magnetism is detrimental to the health of computer disks and tapes. The results of that test have debunked some old myths about magnets and disks.

As any physics student can tell you, the strength of a magnet's field is inversely related to the cube of the magnet's distance from an object. In other words, if you move a magnet away from an object by a factor of 2, its strength drops by a factor of 8.

Here are some true/false questions about magnets. The answers, based on the bureau's tests, may surprise you.

 A small magnet can erase disks or cause data loss.

True—but you have to work at it. A 1000-oersted magnet, which can lift 40 pounds, was placed within one inch of a computer tape with no effect. At one-half inch, the data was destroyed. The read/write heads in a disk drive have a field strength of between 750 and 1000 oersteds, and they must practically touch the disk surface to operate. An extraneous field of 200 oersteds can cause a loss of data, but one of 150 oersteds will not. Maybe that secretary wasn't so dumb if he simply hung the disk by its hole on the magnet.

 Airport metal detectors can damage computer disks.

False. Walk-through and handheld detectors have a strength of about five oersteds. That strength is much too weak to affect a disk. Of course, if you check your suitcase with an airline and you have valuable disks inside, that almost guarantees their loss.

 A magnet near your disks can cause gradual damage.

False. Magnetism is not like

ation. Its effects are not cumulative. The magnetic particles in a disk change polarity almost instantaneously. It just seems to take forever with a 1541. So don't worry about a magnetic paper clip dispenser that's sitting next to your computer.

 Radiation from a microwave oven can damage magnetic media.

False. The bureau warmed cassette tapes in an oven without losing any data. Slip the disk and a cheese sandwich into a microwave, however, and they'll both melt from the heat. A warped disk doesn't spin very well, but the cheese improves its flavor.

The bureau's tests prove that while magnets can cause data loss, distance is the deciding factor. A small magnet can be harmful if it comes in contact with a disk's surface, but you shouldn't have any problems with even a large one as long as you keep it an inch or two away.

(Editor's note: This article was adapted from National Bureau of Standards data and an article by Keith Faulkner that has appeared in a number of user group newsletters, including "Dis-Klosure," from the Salt City Commodore Club of Hutchinson, Kansas.)

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security can be alleviated by keeping backup copies of all software. Backup software must be stored away from the computer to avoid loss of both copies in a common disaster.

Theft, fire, or natural disasters are often thought of as major culprits responsible for software losses, but they're not the chief offenders. Heat, humidity, electrical storms, and magnetic fields in the environment damage many more programs.

Commercial software should be backed up immediately after purchase, if possible. An archival copy that won't be used unless the original is damaged should be maintained. For important software this might even mean purchasing a second copy of the disk. Commodore users realize that many good programs are no longer available. If you're down to one copy of such a program, a backup copy is a necessity.

Public domain software is usually not copy-protected. Several copies should be made and distributed to friends, relatives, and your local user group. Then, if your copy is lost or damaged, a replacement copy can

easily be obtained.

Disk Utility Programs

Good disk utility programs can resurrect or reconstruct programs that are lost. These vary from programs that can undo a NEW or SCRATCH command to sector editors and disk doctors. An excellent sector editor for the 128 is T/E 80 (August 1991). Doc Block (October 1992 Gazette Disk bonus) is a similar program for the 64. Directory Aid (January 1993) can also recover scratched files that haven't been overwritten.

Many public domain disk utilities are also available. They can be found at your local user group or from electronic bulletin board systems serving Commodore computers.

When Trouble Strikes

You usually become aware of a disk failure when an error message appears while you're trying to load a file. If other disks load properly, the error is probably on the disk and not related to the drive. If you have problems with several disks, however, the problem may be due to a drive malfunction or head misalignment. Failure of an often-used disk may be due to wear of the disk's magnetic oxide surface.

A disk utility can be used to recover any usable files on the disk. It's a good idea to make a copy of the entire disk before recovery is attempt-

The Flip Side at 3M

When manufacturers make any floppy disk, they apply the magnetic medium to both sides of the disk. This also applies to disks that are eventually sold as SS or single-sided disks.

According to tales told in user groups and other computer-related gatherings, if disks pulled from a batch for testing fail the manufacturer's quality control checks on their flip sides, that batch of disks is earmarked as SS. If they pass, they're certified and sold as DS.

Some computer users who want to double their disk capacity without paying for a guaranteed medium often cut another write-enable notch on the disk and use the disk as a flippy. While the process usually proves successful, many users shy away from using those disks to store valuable data. There's usually some concern about running into bad sectors on the flip side.

After hearing this story about flip-side tests from many sources,

Gazette checked into it and discovered that the procedure is a little different at one large disk manufacturing company.

A spokesperson at 3M's Diskette Hotline (800-328-9438) said 3M never tested the flip side of its SS disks. (All 3M disks are now rated as DS.) When SS disks were available, they were made with exactly the same care and precision as the DS disks. They were simply packaged and sold as SS disks. They cost less because fewer tests were required.

According to 3M's spokesperson, users with single-head drives can feel confident about using both sides of 3M disks, but she offered some words of warning and advice. Make sure the notches are cut in exactly the right place. A careless cut could damage the magnetic medium and ruin the disk. Also, be aware that cutting a second notch voids the lifetime warranty that 3M puts on each of its disks.

—TOM NETSEL

ed. Then use the copy to perform the recovery operations. This is just a safeguard to prevent further damage to the damaged disk. Next, copy any usable files to a third disk.

Errors may also be detected using a disk check program. The disk check will identify the tracks and sectors that contain errors. However, disk check programs will also identify some benign errors that will not affect disk operation.

A copy program can often recover scratched files if they haven't been overwritten. Some disk errors can be eliminated by using a file copier to transfer all files to a new disk. Errors in file linkage can be corrected in this way, as the file copier will build a new BAM for the disk.

The utility required to salvage damaged disks is a disk editor. It's used to transfer information or parts of a program to a new disk. This is done by using the sector editor to correct and transfer the good sectors to another disk. Parts of the program may not be recoverable, but important routines or data can often be retrieved.

Another function of a rescue program is the ability to isolate bad sectors from damaged software. Once these sectors are isolated, the remaining portions of the program can then be employed.

The power of disk drive utility programs allows even inexperienced users to recover deleted files. Many programs also have procedures for recovering data from a reformatted disk. When a program is scratched or deleted, the file is not erased. A couple of bytes are simply changed to eliminate the program's name from the disk directory. Disks with such files can even be recopied or transferred by modem and the files recovered from the disk copy.

If you wish to maintain any security or privacy regarding programs or data, it's necessary to reformat the disk and overwrite the files you wish to conceal. Keep this in mind when swapping disks with other users to safeguard your data and programs.

Calvin Guild is a retired NASA space mission designer and rocket engineer. He has worked with computers since 1952, when he worked on a team to evaluate the DISIAC computer for space and missile applications. The DISIAC consisted of a double ENIAC, the first all-electronic computer, built in 1946. Mounted in two 44-foot semitrailers and a van, it was the first large-capability, general-purpose, "portable," all-electronic computer.



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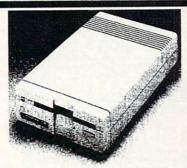
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EASY BOOKS-1

Its title isn't deceptive. While keeping track of your business or personal financial records can be complicated, Easy Books-1 is a bookkeeping program that's easy to use. Just because it's not complicated. don't make the mistake of thinking this program isn't complex. Using Easy Books-1 makes it easy for you to record checkbook and cash receipts, prepare and print a balance sheet, project yearto-date data to the end of the year, print a summary of weekly financial activity with or without a percent analysis, and print all annual expenditures for each expense account.

Easy Books-1 is much easier to use than other, more expensive accounting programs that I've tried in the past. It's also easier to read and understand its basic printouts than it is to decipher spreadsheets.

Easy Books-1 is designed for the cash basis business that doesn't need inventory tracking, yet it's also set up for the individual who wants to track household expenses and budgets. Its uncomplicated design makes it ideal for the computer beginner as well as the veteran. Another feature that I appreciate is trailing 0s. I prefer to see \$45.60, rather than \$45.6.

More than half of the manual is devoted to a sample week of business activity. After you load the program, I highly recommend that you work through this sample. It's a well-thought-out tutorial that contains what you'll need to know, starting with an explanation of the main menu and the preparation of a data disk.

The main menu has 10 cat-

MHAT CATEGORY WILL THIS CHECK OR RECE BE FOR? KEY 'F8' TO RETURN TO MAIN MEI	PT
MARNING F8 WILL ERASE ANY UNSAVED DA	Ti.
A-ADVERTISING C-BANK SERVICE CHG D-CAR/TRUCK EXP E-CHILDCARE F-COMMISSIONS	
G-DEPREC./SEC 179 H-DUES & PUBLICA I-EMPLOY BENEFITS J-INSURANCE K-INTEREST L-LAUNDRY & CLEA	
M-LEGAL & PROF. O-PENSION/PRF SHAR P-RENT R-SUPPLIES N-TAXES	3
T-TRAVEL & ENT U-WATER/SEWER/TR V-NATURAL GAS W-ELECTRICITY X-TELEPHONE Y-WAGES PAID Z-WNDFLL PRF TX WH F1-OTHER ITEMS	SH

The Easy Books-1 expense menu lists 27 different predefined categories found in most businesses.

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Easy Books-1 makes it easy for you to track and analyze weekly and annual expenditures for your home or business.

egories that take you to all sections of the program, each with its own in-depth, individualized menu. The expense menu, for example, is a listing of 27 different predefined categories, including one for miscellaneous expenses that don't fit into any of the 26 other categories. Although many expense categories are already defined, most of them can be changed. Therefore, if you don't have a need for one of

the listed expenses, you can change it to one you can use.

Included in the expense categories are advertising, bad debts, bank service charges, car/truck expenses, commissions, dues, employee benefits, insurance, interest, laundry, professional fees, office expenses, pensions, rent, repairs, supplies, taxes, travel/entertainment, wages paid, and windfall profit withholding. All of

these categories can be changed by the user. Non-changeable categories are child care, depreciation, water-sewer-trash, natural gas, electricity, telephone, and other. The costs of the four utilities are presented as a total utility expense for your analysis, but they are kept separate for total expense purposes.

With a list this extensive, most of your personal and business needs should be covered. But since this program allows you to be creative, you aren't limited to this list. You can tailor the program to fit your needs, to make it a personalized bookkeeping program.

Most individuals and companies borrow money at some time or another. It's important to keep track of interest paid to credit cards, home loans, or other business-related loans. To use the interest category, which records the interest part of your payment only, you'll need an amortization schedule for each loan. As an alternative, you can wait until the end of the year when you receive statements from financial institutions showing your total interest payments. Either form of data entry will work to ensure that your annual amount of interest paid is correct. You can also set up more than one interest category, if you need them.

One of the expenses listed is depreciation. I have little working knowledge of this topic. Fortunately, this program doesn't expect you to be a depreciation whiz. When you enter an expense in the depreciation category, the program automatically takes you to a depreciation worksheet instead of the expense summary. If you don't use an account-

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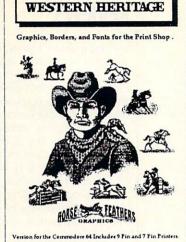
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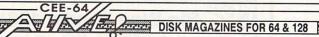
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REVIEWS

ant, the manual tells you which IRS publication to consult to set up a depreciation schedule. In the back of the manual are another four pages that answer almost any question you might have on how to figure depreciation.

Data input is simple to master. Press a single key to make most any menu selection, and then enter your data when you see a question mark before a blinking cursor. The program will not proceed until you press Return. You can correct any typing errors with the Del key before you press Return. Pressing Return one or more times will usually let you exit a screen if you don't want to enter any data.

If you need to make a correction after you've hit the Return key, wait until you're at the end of a section. There you'll receive either the prompt IS THIS CORRECT? or the prompt DO YOU WISH TO START AGAIN? These prompts will give you an opportunity to correct any mistakes that you might have made. You'll have another chance to make changes when you use the second menu and review your input for expenses and receipts.

The author states that the printing module is the system's best feature, and he's right. The format is easy to use and understand. Forget about mastering complicated spreadsheets filled with little-used options; with this program that's not necessary. The print menu offers 11 different printouts. One rather nice feature is a list of checks by expense. At the expense menu, each category that has an expense entered will be highlighted. By selecting only the highlighted categories, you don't have to wait for the computer to search all the weekly files. That's a real timesaver!

Easy Books-1 wasn't written with speed in mind. It doesn't have the fastest execution time, but it makes up for that with its ease of use. You don't need to consult the manual constantly to use this program either. Its clear, concise menus and onscreen instructions make it easy to master. Devote your time and energy to running your business, not bookkeeping. If easy bookkeeping is what you're looking for, then Easy Books-1 is what you need. CHERYL TURNEY

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WORLD VIEW

John Buckingham

THE VIEW FROM AUSTRALIA

Australia, the land down under, is a commonwealth of some 17 million people from differing backgrounds and origins. Commodore entered the Australian market years ago with the VIC-20 and then followed up with the popular 64, which went on to become the most popular home computer in the nation.

Until the onslaught of the Amiga, every computer store and large retail chain was clamoring to have 64/128 stock on its shelves. But with Commodore pushing the Amiga and its PC line, it's now difficult to find 64 products except at a few computer games outlets or by mail order.

It's inevitable that some 64 owners upgrade to larger systems. When they do, many of them sell their older equipment. By making inexpensive secondhand hardware and software available to new buyers, they've caused a resurgence of 64 activity. The recession is keeping people to tight budgets, but they're finding that the 64 represents good value for their money.

The number of user groups and clubs catering to the 64/ 128 user is diminishing, although larger groups in big population areas are still active. One of the main problems seems to be a lack of communication between user groups. I'm presently working to establish a register of groups in Australia to enable users to maintain regular contact with a greater number of other 64 users. By staying together we can survive.

There are only three or four nationally advertised public domain libraries in Australia, but many user groups have their own software libraries. The few bulletin boards that cater

to the 64/128 user still have a lot of PD programs for downloading. The main PD libraries charge around \$A5 for a double-sided disk, but it's possible to buy disks for as low as \$A3. Blank disks vary from about 40 cents to a couple of dollars each. These prices are in Australian dollars (\$A). With the current exchange rate, one Australian dollar is worth about 75 U.S. cents.

Most PD software emanates from the U.S. these days. We occasionally have problems with such software, especially programs that use dates. Here in Australia, we use a day/month/year format, while programmers in the U.S. apparently use a month/day/year format. Also, our state abbreviations have three letters, not two as in the U.S.

GEOS is very popular over here, and more users convert to it every day. A lot of 64s are used only as game machines, so game software far outsells any other type of program.

Both hardware and software are less expensive in the U.S. than here, and many Australian users purchase through U.S. mail-order dealers. Here are several examples of price comparisons: a 1541-II drive-\$A279, \$185; GEOS-\$A68, \$39; Xetec interface-\$A109, \$59; The Print Shop-\$A80, \$35; Where in the World Is Carmen Sandiego?—\$A70, \$29. A 9-pin printer such as a Star NX-1000 costs around \$A300 over here, but in the U.S. you would pay no more than \$180. So we Australian users are certainly paying much more than our U.S. counterparts. Most U.S. hardware is unsuitable for us because of the voltage differences, but software, interfaces, and REUs are OK.

There are many thousands of bulletin boards operating in Australia, but very few cater specifically to 64/128 users except to offer message boards and echo areas. Those that do have 64 files for downloading are usually very busy. Three main bulletin boards cater to GEOS, and these are very popular. Some software clubs and user groups have small BBSs that are used regularly by their members. But a great number of 64 users don't have modems because of the lack of nearby BBSs.

CompuServe has now begun operating in Australia, but its minimum cost is \$36 an hour, plus long-distance call fees for those who live outside the major cities. This high price makes it out of reach for most 64/128 users.

The Australian Commodore & Amiga Review (ACAR) has been the only commercially produced magazine for 64/128 users in Australia for many years. It started out as a VIC-20 magazine—without Amiga in its name, of course. Now, out of its 80 pages each month, only 5 or 6 are devoted to the 64. In September 1992 the number dropped to only one page for the 64.

Fortunately for us, a new 64/128 magazine called *Commodore Network* has just begun. It's produced in a newsletter format, but we expect it to improve with time. Former *ACAR* columnists are now part of the new magazine. I hope Australian users will support it.

The U.S. magazine COM-PUTE with its Gazette section is available, and RUN was here until it folded. We also get U.K. magazines Zzap, Commodore Format, and YC. They are quite popular and readily obtainable here.

The 64 is still alive in Australia despite other machine users telling us that we're a dying breed. If the user groups and publications that support us now stick with us, we'll certainly be around for many more years.

Inexpensive secondhand hardware and software have caused a 64 resurgence in Australia.



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FEEDBACK

Bug-Swatter

We printed some incorrect information about Compsult in "A Buyer's Guide to Commodore Software, Hardware, and Services" (December 1992). Here is the correction.

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We regret any inconvenience our error may have caused either Compsult or our readers.

Melvin Brevfoale notified us

that Ham Antennas (December 1992) has a couple of problems with its Long Wire option. The screen colors make a portion of the program difficult to read, and the calculation for the coax wavelength in feet is incorrect. If you've already entered the program or if you have Gazette Disk for that month, load Ham Antennas and enter the following lines before you run it. This should correct the problems. Remember to save the corrected program.

GH 4027 GOSUB4097:INPUT:PRINT" {CLR}{6 SPACES}LONG WI RE CALCULATIONS"

MX 4050 PRINT" (RVS) (YEL) (DOWN) LENGTH OF WIRE IN FEET

BX 4060 PRINT" [DOWN] "492*V/F" {3 SPACES}=1/2 WAVE CO AX AT DESIGN FREQ IN F

For the prompt in the Long Wire option that requests coax velocity factors, supply the following decimal values, depending on the type of transmission line you are using. Include the decimal when you enter the factor. For RG8 (50 ohm) use .66, for RG11 (75 ohm) use .88, and for flat TV line (300 ohm) use a factor of .82.

If your transmission line is made of material not listed here, check with a good ham antenna reference book for the correct velocity factor. For convenience, you may want to store this information as a REM statement within the program or have it print in conjunction with line 4059.

Reset to 64 Mode

Six months after I bought my 128, I joined a user group to find out why I couldn't reset to 64 mode from 128 unless I had my FastLoad cartridge inserted. No one could help. I wrote to Commodore and even visited other user groups, but no one offered a viable solution.

Several months later, I was making up a list of hints and tips for printer commands. and I came across the solution: Hold down the Commodore key while pressing the Re-

Once you know this trick, it's obvious, but perhaps it'll help some newcomers.

BILL CLARK LYNDEN WA

To Scratch a Comma

I have a file that I want to scratch from a disk, but I can't seem to do it. The filename is simply a comma (,). I've tried using the SCRATCH command, but it doesn't work. Got any suggestions? MAX YOUNT WALDEN, TN

That file is going to be difficult to remove. The 64 processes the comma as a delimiter, which is a character that's used to separate two parts of a command. For example, when you want to read a sequential file, you have to open it with OPEN 2.8.2. "filename, S,R" (note how the commas separate the filename from the S for Sequential and the R for Read). The commas

perform a special function. and the disk drive doesn't recognize them as characters in the filename. As a result, your drive sees the file as "delimit-er/end of filename." This ren-ders the SCRATCH and RE-NAME commands useless.

There is a solution to your problem, however. If you have a disk editor (a program that can change a byte directly on the disk), you can change the comma on the directory to, say, an X, and then scratch that new filename. We published such an editor, Doc Block, as a bonus program on the October 1992 Gazette Disk.

Another way to clear up the problem is to copy any files or programs on that disk that you wish to save to another disk. Then reformat the disk with the bad file. To avoid this problem next time, stick to letters and numbers when naming disk files. Avoid punctuation marks like commas, colons, and asterisks.

Multicolor Sprites

How can I use more than one color with a sprite? GEOFF CLARK NOTTINGHAM, ENGLAND

Sprites are powerful graphics tools, but they can be complex to use. After you've worked out the shape that you want, the sprite must be converted to data statements and poked into a safe area of memory. A pointer must be set to the sprite shape, the xand y-coordinate designated. the color defined, and the sprite activated.

Multicolor sprites give you more flexibility and more interesting shapes to work with. If you've reached the point where you can define sprites and move them about the screen, now's a good time to experiment with color. There are two ways to do it.

Corrections to articles and programs, hints for beginner 128 users, and more

The first is fairly easy. Define two sprites, using different colors, and put one on top of the other. Sprites are displayed in a certain order of priority, from lowest number to highest. This means that sprite 0 will always appear on top of (or in front of) all other sprites. Sprite 1 has priority over sprites 2–7, and so on.

Normally, if a bit is turned on, it'll appear on the screen in the color of the sprite. An off bit will let the background color show through. If you have one sprite on top of another, the off bits will let the second sprite's color show through. (The second sprite is the one with the lower priority.) As long as they have the same (x,y) location, it will appear that you have a single two-color sprite.

There are two drawbacks to this method, however. The first is that instead of having eight one-color sprites, you're limited to four two-color sprites (or two four-color sprites). Second, if your program needs to check sprite collisions, you have to be careful that the bits of the overlapping sprites do not intersect. You may get collisions when none actually exist if the program is written in BASIC.

A better way to make colorful sprites is to switch to multicolor mode, controlled by a register at 53276. The eight individual bits correspond to the eight different sprites. To make all sprites one color, enter POKE 53276,0. Poking a 1 makes sprite 0 multicolor (and the others one color), poking a 2 makes sprite 1 multicolor, poking a 4 makes sprite 2 multicolor, and so on up to 128, which affects sprite 7. Poking a 255 makes all of the sprites multicolor.

Multicolor mode gives you up to four different colors in each sprite. The four colors include the screen color (actu-

ally a transparent part of the sprite allowing the background screen color to show through), individual sprite color, sprite multicolor 0, and sprite multicolor 1. The individual sprite color can vary from sprite to sprite, but screen color and the two multicolors are the same for all eight sprites. The register for screen color is 53281. The registers for sprites 0-7 are 53287-53294, respectively. For multicolors 0 and 1, the registers are 53285 and 53286.

To turn on the multicolor mode for a single sprite, enter POKE 53276, PEEK(53276) OR (2[†]N), where N is equal to the sprite number (0–7). To turn off the multicolor mode, enter POKE 53276, PEEK(53276) AND (255-2[†]N).

Unlike the first method of adding color, multicolor mode lets you have eight different sprites moving around, but resolution is cut in half. Instead of coloring individual pixels, pairs of pixels are turned on or off. Let's say that one of the data statements is 50, which translates to a pattern of 00110010 in binary. With one-color sprites, a 1 represents a pixel that is turned on. In multicolor mode, however, you have to look at the pattern as bit pairs: 00, 11, 00, and 10. The first two pixels (00) would be transparent, the same color as the screen. The next two (11) would be multicolor 1, followed by the screen color again. The last two (10) would both be the sprite color. Even though the two bits are different, 1 and 0, the corresponding pixels would be the same color. Instead of each byte controlling eight different pixels, each byte controls four different pairs of pixels.

Two Drives for SpeedScript
I've been using SpeedScript,
which I typed in from your

magazine in September 1989. It works great, but I have one problem. Can you get a patch for it or a short program that will let you use it with two drives?

LEONARD PFEIFFER DAYTON, NJ

In the July 1992 issue, George Gunn wrote an article about the 1581 drive called "The Smaller, The Better." As a sidebar to that article, he included several POKEs which enable SpeedScript users to access drive 9 instead of drive 8. This will let you load SpeedScript from drive 8 and then direct all disk commands to drive 9.

To accomplish this, load but do not run SpeedScript. Then enter the following two lines in immediate mode.

POKE 4843,9: POKE 4908,9: POKE 5274,9: POKE 5873,9: 5967,9 POKE 6367,9: POKE 6883,9: POKE 7003,9: POKE 7073,9

Save this modified version with a unique name, such as SPEEDSCRIPT9. When you load and run this program, all normal disk commands will be addressed to drive 9. You won't be able to switch back and forth between drives, but you can load and work with whichever version of Speed-Script you wish, depending on your needs.

To switch between two drives while in SpeedScript, check out Speedram-64 (December 1992). This short patch by Frank Gordon lets you use SpeedScript with a 1764 RAM expansion unit or with two drives.

Send your questions and comments to Gazette Feedback, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

How to use multicolor sprites and SpeedScript with two drives

BEGINNER BASIC

Larry Cotton

IN A LOOP WITH FOR-NEXT

Last March, I issued a plea for topics to discuss in this column. I received many helpful suggestions—and not one suggesting that I pack it in! I had several requests for columns that adhere to the title's premise—BASIC for beginners. Therefore, this month, we'll review the seemingly ubiquitous FOR-NEXT statement.

FOR-NEXT is used to put a program in a loop; FOR and NEXT are at the ends of the loop. The whole process requires seven distinct items.

1. the word FOR

2. a counter (any valid numeric variable)

3. an equal sign

4. a counter's starting value

5. the word TO

6. the counter's ending value

7. the word NEXT

The starting and ending values for the counter must be valid numeric expressions—that is, numbers or variables that represent numbers.

Here's a simple time delay loop. It uses all seven items in lines 10 and 20.

10 FOR C=1 TO 1000 20 NEXT 30 PRINT"END OF LOOP"

C is the counter; it increments itself from 1 to 1001, as fast as the BASIC language and the computer will allow. Try pressing the Run/Stop key while this program is running; then enter *PRINT C*.

The first six parts of a FOR-NEXT loop must be written on the same line. The NEXT command may be written on the same line (with a colon separating it from the FOR part of the loop) or on another line.

If uninterrupted, this delay loop increments C to 1001,

NEXT kicks in after the value for C exceeds the upper limit of 1000, and control then falls through to line 30. When things happen between FOR and NEXT, they happen the number of times specified by the counter's ending value.

Delay loops are often used just after a message is printed on the screen. I don't like them, however, because they're usually too short the first time they appear and too long after the user becomes familiar with the message. A better way is to eliminate the delay loop altogether and use GET to wait for the user to press a key whenever he or she is ready to move on.

There are many, many uses for FOR-NEXT. One of them is to gather multiple inputs from a program's user. This is often used in conjunction with arrays. (We'll review arrays in a later column.)

10 PRINTCHR\$(147)
20 FORC=1T04
30 INPUT"NAME OF A
STATE";S\$(C)
40 NEXT:PRINT
50 PRINT"THE STATES YOU
ENTERED ARE"
60 PRINT:FORC=1T04
70 PRINTS\$(C)
80 NEXT

As C is incremented from 1 to 4 in line 10, the array is filled with words the program's user enters. S\$(1) might be *Virginia*, S\$(2) might be *Utah*, and so on. The program will ask for just four state names and then move on to line 50.

You can use C again in line 50, but it's not necessary. The following would also work for lines 50-70.

50 PRINT:FORZ=1T04 60 PRINTS\$(Z) 70 NEXT

You can accomplish lots of

tasks between a FOR and a NEXT. However, it's quite easy to lose track of where you are, especially if you use multiple or nested FOR-NEXT loops. Here's a nested one.

10 PRINTCHR\$(147) 20 FORJ=1TO3 30 FORK=1TO4 40 PRINTJ;K 50 NEXT:PRINT:NEXT

The first NEXT in line 50 closes the inner K loop; the second one closes the outer J loop. To keep track of what's happening in nested loops, it's a good idea to use BASIC's option of printing the counter's name after the NEXT. Line 50 could've been written as follows. Note the order of the J and K.

50 NEXTK:PRINT:NEXTJ

The PRINT in line 50 just gives a visual separator between the three groups of four numbers on the screen. Here's a short graphic program that contains several FOR-NEXT loops.

10 POKE53280,1:POKE53281,1 20 PRINTCHR\$(147)

30 FORJ=1TO10:READC(J):NEXT

40 B=4:H=32:R=18 50 POKE214,24:PRINT:

POKE211,B 60 FORT=1TO23:REM NUMBER OF

LINES
70 FORU=1T010:REM NUMBER OF

COLORS 80 PRINTCHR\$(C(U))CHR\$(R)

CHR\$(H); 90 NEXTU:PRINT:PRINTTAB(T+B);:

100 FORD=1T01000:NEXT

110 FORP=1T025:PRINT:NEXT 120 DATA149,28,129,150,158, 153,159,154,156,31

You may have to adjust your monitor's color controls for maximum effect. Next month, we'll see what STEP does to a FOR-NEXT loop.

Use the FOR-NEXT statement to put a BASIC program into a loop.

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Jim Butterfield

Strange Opcodes

An operation code is the instruction that tells the computer what to do. The opcodes for the 6502 CPU fit in a single byte; out of 256 possible combinations, only 151 are "legal." The remaining combinations are not supported by the chip manufacturer, but some of them work, often producing strange results.

You shouldn't use these codes in your regular programming sessions because they are not guaranteed to work consistently. Some of them are more reliable than others, however, and they appear in software occasionally without causing any problems. Some family versions of the 6502 in other computers put these undefined codes to work regularly; you would find this to be true in the case in the Apple lles, for example.

Even so, many of the extra codes sometimes do interesting and useful things. We'll experiment here with one of these. Even so, try not to make a habit of using these nonstandard instructions in your programs.

Perhaps the most interesting codes are those whose last two binary bits are 11. Written in hexadecimal, these codes would have a second digit of 3, 7, B, or F. No such codes are legal, but almost all of them exhibit an interesting characteristic: Their action is a combination of the next two opcodes in numeric order. For example, the code for load A (absolute) is hex AD and for load X is AE, so hex AF causes both A and X to be loaded! Other address modes work. For example, A7 does the same thing using 0 page addressing.

Some codes are deadly.
Hex 02, 12, 22, and so on up to 72 will cause the processor to crash. Resetting will put or value of and as the three remains to crash.

things back to normal, of course.

The first complete documentation of these extra opcodes was compiled in 1981 by Brian Grainger, a member of a user group in the United Kingdom. The various opcodes were given names about that time. The LDA/LDX mixture above, for example, was dubbed LAX.

For a small project, let's calculate the parity of a byte by using extra-code instruction LSE, which is a mixture of LSR and EOR. First, we logically shift right the accumulator (LSR) and then exclusive-or (EOR) the operand value. If we were writing a conventional parity calculation program, we might use EOR and LSR as separate instructions to do the job. In absolute addressing mode, LSR would be an opcode of hex 4E; EOR would be 4D. Code 4F combines the two to make LSE.

The program calculates parity—odd or even—of binary values from 0 to 16 (hex 10) inclusive. The parity subroutine, at address \$201A, is called with the selected value in the A register and also stored at address \$203F. We'll look at the subroutine code in detail.

The parity bit we are calculating will be in the low-order bit of the accumulator. The first bit is already there, so we need to loop seven times to get the eight bits. Set our counter to 0.

201A A0 00 LDY #\$00

Here comes our nonstandard opcode. LSE, code \$4F, will right-shift the contents of address \$203F and then EOR that value into the accumulator. Bit 0 of the accumulator will then contain the exclusive-or value of the two low bits, and as the loop continues, the remaining bits will be worked in

201C 4F 30 20 LSE \$203F

The remaining subroutine code bumps the Y counter and loops seven times.

201F C8 INY 2020 C0 07 CPY #\$07 2022 D0 F8 BNE \$201C 2024 60 RTS

It's worth noting that when the subroutine returns, the parity information is stored in the low bit of the A register. We can extract and test it very simply by moving it into the carry flag with instruction LSR.

2009 A0 45 LDY #\$45 ; ascii E for Even 200B 4A LSR A ; move test bit to C flag 200C 90 02 BCC \$2010 ; even parity, skip ahead 200E A0 4F LDY #\$4F ; odd parity, O for Odd 2010 98 TYA ; move E or O to A reg 2011 20 D2 FF JSR \$FFD2 ; print E or O

Here's a listing that pokes the data in from BASIC.

100 PRINT "JIM BUTTERFIELD'S ILLEGAL OPCODES!"

110 DATA 162,0,138,141, 48,32,32,26,32

120 DATA 160,69,74,144,2, 160,79,152

130 DATA 32,210,255,232, 224,17,208,233,96

140 DATA 160,0,79,48,32,

200,192,7,208,248,96 200 FOR J=8192 TO 8228

210 READ X:T=T+X

220 POKE J,X

230 NEXT J 240 IF T<>4228 THEN STOP

300 PRINT "PARITY OF BINARY VALUES 0 TO 16:"

310 SYS 8192

(Editor's note: For more information about unconventional 6502 opcodes, see Randy Thompson's "Programmer's Page" on page G-20.

Unconventional opcodes sometimes do strange, interesting, and useful things.

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PROGRAMMER'S PAGE

Randy Thompson

SECRET 6502 OPCODES REVEALED

CPU manufacturers often release their chips with several undocumented opcodes hidden inside. Take the 6502, for example. The sleuthing of several exceedingly curious programmers has turned up about a dozen unofficial 6502 machine language instructions—instructions such as LAX, which loads both the accumulator and the X register with a value from memory.

Whether these opcodes were omitted from the CPU's specifications accidentally or were an unintentional by-product of the chip's design is unclear. In any case, there are more functional 6502 opcodes than most assembly language manuals reveal. Here are a few that I discovered in some old articles and books. most notably "Complete Inner Space Anthology" by Karl J.H. Hildon in Transactor and Programming the PET/CBM, by Raeto Collin West, published by COMPUTE Books.

Because these opcodes are unofficial, I'd be surprised if you could find an assembler that supports them. In fact, the opcodes' mnemonics (the letters used to identify each instruction) were invented by the programmers who discovered the instructions. As a result, to use any of the opcodes listed below, you'll probably have to enter their numerical value into your code using a machine language monitor or an assembler's byte editor. Now, this is programming at the machine level. (See Jim Butterfield's "Machine Language" column in this issue for more information about how to put one of these secret opcodes

Please note that all opcode values in this article are given in hexadecimal. These hexadecimal values are listed immediately to the right of any sample code. The lowercase letters found in these examples represent the hex digits that you must provide as the instruction's immediate byte value or as the instruction's destination or source address. You should have a good understanding of the 6502's different addressing modes and how machine language is stored in memory if you plan on putting any of these "secret" opcodes to work.

ALR

This opcode ANDs the contents of the A register with an immediate value and then LSRs the result.

Supported modes:

ALR #ab ;4B ab

Here's an example of how you might write it in a program.

ALR #\$FE :6B 02

Here's the same code using equivalent instructions.

AND #\$FE LSR A

ARR

This opcode ANDs the contents of the A register with an immediate value and then RORs the result.

Supported modes:

ARR #ab :6B ab

Here's an example of how you might write it in a program.

ARR #\$7F ;6B 02

Here's the same code using equivalent instructions.

AND #\$7F ROR A

ASO

This opcode ASLs the contents of a memory location and then ORs the result with the accumulator.

Supported modes:

ASO abcd	;OF dc ab
ASO abcd,X	;1F dc ab
ASO abcd,Y	;1B dc ab
ASO ab	;07 ab
ASO ab,X	;17 ab
ASO (ab),X	;03 ab
ASO (ab),Y	;13 ab

Here's an example of how you might use this opcode:

ASO \$C010 ;0F 10 CO

Here's the same code using equivalent instructions.

ASL \$C010 ORA \$C010

AXS

AXS ANDs the contents of the A and X registers (without changing the contents of either register) and stores the result in memory.

Supported modes:

AXS abcd	;8F dc ai
AXS ab	;87 ab
AXS ab,Y	;97 ab
AXS (ab).X	:83 ab

Example:

AXS \$FE ;87 FE

Here's the same code using equivalent instructions.

STX \$FE PHA AND \$FE STA \$FE PLA

INS

This opcode INCs the contents of a memory location and then SBCs the result from the A register.

Think you know all of the opcodes for the 6502? Here are some that the manuals never mention.

Supported modes:

INS abcd ;EF dc ab INS abcd,X ;FF dc ab INS abcd,Y ;FB dc ab INS ab ;E7 ab INS ab,X ;F7 ab INS (ab),X ;E3 ab INS (ab),Y ;F3 ab

Example:

INS \$FF ;E7 FF

Here's the same code using equivalent instructions.

INC \$FF SBC \$FF

LSE

LSE LSRs the contents of a memory location and then EORs the result with the accumulator.

Supported modes:

LSE abcd ;4F dc ab LSE abcd,X ;5F dc ab LSE abcd,Y ;5B dc ab LSE ab ;47 ab LSE ab,X ;57 ab LSE (ab),X ;43 ab LSE (ab),Y ;53 ab

Example:

LSE \$C100,X ;5F 00 C1

Here's the same code using equivalent instructions.

ASL \$C100,X EOR \$C010,X

OAL

OAL ORs the A register with #\$EE, ANDs the result with an immediate value, and then stores the result in both A and X.

Supported modes:

OAL #ab ;AB ab

Here's an example of how you might use this opcode:

OAL #\$AA ;AB AA

Equivalent instructions:

ORA #\$EE AND #\$AA TXA

RLA

RLA ROLs the contents of a memory location and then ANDs the result with the accumulator.

Supported modes:

RLA abcd ;2F dc ab RLA abcd,X ;3F dc ab RLA abcd,Y ;3B dc ab RLA ab ;27 ab RLA ab,X ;37 ab RLA (ab),X ;23 ab RLA (ab),Y ;33 ab

Example:

RLA \$FE,X ;37 FE

Equivalent instructions:

ROL \$FE,X AND \$FE,X

RRA

RRA RORs the contents of a memory location and then ADCs the result with the accumulator.

Supported modes:

RRA abcd ;6F dc ab RRA abcd,X ;7F dc ab RRA abcd,Y ;7B dc ab RRA ab ;67 ab RRA ab,X ;77 ab RRA (ab),X ;63 ab RRA (ab),Y ;73 ab

Example:

RRA \$030C ;6F 0C 03

Equivalent instructions:

ROR \$030C ADC \$030C

SAX

SAX ANDs the contents of the A and X registers (leaving the contents of A intact), subtracts an immediate value, and then stores the result in X.

Supported modes:

SAX #ab ;CB ab

Example:

SAX #\$5A ;CB 5A

Equivalent instructions:

STA \$02 TXA AND \$02 SBC #\$5A TAX LDA \$02

Note: Memory location \$02 would not be altered by the SAX opcode.

XAA

XAA transfers the contents of the X register to the A register and then ANDs the A register with an immediate value.

Supported modes:

XAA #ab ;8B ab

Example:

XAA #\$88 ;8B 88

Equivalent instructions:

TXA AND #\$88

Do you have an interesting programming tip or trick for the 64 or 128 that you'd like to share? "Programmer's Page" is interested in receiving them. Send all submissions to Programmer's Page, COMPUTE's Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. We'll pay \$25—\$50 for each tip that we publish.

Steve Vander Ark

FOUR-DRIVE GEOS

Not long ago I spent a good deal of space in this column bemoaning the lack of a good way to handle four drives from GEOS. Since then I've received several new products which make all my worrying a thing of the past.

Yes, GEOS can handle four drives. The problem is that the GEOS program itself is written to look at drives in groups of two-A and B together, and then C and D. All GEOS applications, such as geoWrite and geoPublish, use those routines and therefore inherit an invisible barrier which prevents you, if you're in A and B. from talking to C or D, and vice versa. GEOS 2.0 jerryrigs a way around this problem by letting you swap your third drive for either your first or second drive from the desk-Top. You still have only two active drives, but you can access a third with some effort.

The fourth drive became part of the game with the release of DualTop, a program that I've mentioned in this column before. In the latest version, released by New Horizon Software last summer, you can access drive D as long as you're on the DualTop screen itself. Once you enter an application, however, the old biases surface, and you run the risk of crashing your system if you don't have the right things on the right drives.

For the author of DualTop, Paul Murdaugh, that wasn't good enough. He decided it was time to fix things once and for all. So, he wrote a series of patch programs which modify GEOS and GEOS applications to fully support the third and fourth drives. Yes, fully support them. If you run his patches over your copy of geoWrite, for example, you can have your document in drive A and geoWrite in drive

D, and when you double-click on the document, it'll open just as nicely as you please. Four-drive support is here.

One more thing. Back in the December issue. I reported that DualTop, while supporting CMD devices such as the RAMI ink and FD-drive. couldn't access native mode partitions. I said that to use one of these devices most effectively in GEOS, you needed to use native mode partitions, subdirectories, and so on. I concluded, sadly, that there was no four-drive file handler which could properly access these high-powered drives. Well, I was wrong. Dual-Top will handle native mode partitions just fine, providing that you boot up with Gateway. You can get yourself a copy of the latest version of DualTop by writing to Paul Murdaugh at New Horizon Software, 2253 North Kansas Avenue. Sprinafield. Missouri 65803. New Horizon will also patch your applications and GEOS 64 or 128 kernel to run fully with three or four drives. Send \$5 per patch and a disk with whichever applications you want patched, and you're in business.

Another new program will let you access all four drives. It's called geoSHELL, and it brings a new twist to the GEOS interface. Usina GeoSHELL, a command line interface, is a lot like using a Commodore before GEOS showed up with its point-andclick environment. GeoSHELL provides you with a prompt where you type in commands to make GEOS do its tricks. Its commands are very powerful indeed, containing enough bells and whistles to make geoSHELL a very attractive alternative to the deskTop or other replacement. GeoSHELL is available for \$24.95. You can order it by writing to Maurice Randall, P.O. Box 606, Charlotte, Michigan 48813.

Creative Micro Designs, the company which brought you the RAMLink and Jiffy-DOS, has released new versions of Gateway and Perfect Print, as well as a disk of some of some excellent GEOS utility programs written by Jim Collette. This Collette Utilities disk includes geoWizard, which no GEOS user should be without. and Font Edit 2.5, the best fontdesign tool around. For more information, write to Creative Micro Designs, P.O. Box 646. East Longmeadow, Massachusetts 01028.

Another company that supports the GEOS community with new products is The Soft Group. It sells VideoByte II, a digitizer that plugs into your computer's user port. This product creates images in multicolor mode, which until recently meant that they weren't directly compatible with GEOS and its high-resolution mode. A new cartridge called Video-Mate provides a bridge between the two with a GEOS version of the VideoByte driver. When you activate the VideoBvte desk accessory in geoPaint, you're given a control panel which lets you activate the digitizer. Once you've captured an image, the Video-Mate cartridge converts it into high-resolution mode and places it in the geoPaint window. VideoMate (\$49.99) and VideoByte II (\$69.99) are available from Tenex, P.O. Box 6578, South Bend, Indiana 46660.

There are many more great products that deserve a mention here, but I'm running out of room. Hang on until next month, when I'll run through a list of some of the latest shareware and public domain programs that have made appearances recently on Q-Link.

Speaking of Q-Link, feel free to contact me by E-mail there. I am SteveV14.

Power GEOS users can fully access four drives with this latest update from New Horizon.



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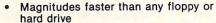
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D'IVERSIONS

Fred D'Ignazio

FRANK THE FIREPLACE AND LARRY THE LAMP

A recent issue of the New York Times reported on new electronic gadgets that let you control every appliance in your home. The gadget deluxe, SmartHome, is an all-inone product that costs \$15,000 and lets you automate over 200 common household devices. SmartHome is an alarm system and a heating and cooling controller. It starts your coffee perking at a set hour, and it starts cooking your roast. One universal "zapper" with only 4000 buttons lets you walk around your home, magically bringing good things to life.

Unfortunately, SmartHome is already a dinosaur: a wired labyrinth with hundreds of feet of cable lurking behind the walls. It's bulky, difficult to install, and far too expensive for the average homeowner. In fact, SmartHome uses an older generation of microprocessors and really isn't so smart.

A new generation of wireless home-control gadgets is just around the corner. These gadgets are slick, tiny, and inexpensive, featuring the latest microprocessors and miniaturized circuits. These devices will spring to life instantlywhen a person enters a room. when a person speaks, when daylight dawns, when the temperature drops, when night falls. The complicated zapper will be rendered obsolete by a new generation of "personal digital assistants" that respond to spoken words, the snap of fingers, the silent rhythms of morning and evening, and coolness and heat.

I can imagine that almost every conceivable item has become an electronic personal digital assistant with its own name and probably its own voice and personality.

The question is whether the accumulation of these humanlike assistants will be a homeowner's dream or a disaster. Let's peek into the living room of an average home, in late winter, sometime in the late 1990s. Enter one male human adult, theoretically the master of the household. Instantly, dozens of tiny, invisible electronic gremlins spring into action. The lights in the room blink on. The fireplace gasps, and gasfed flames curl up metal logs. The CD player consults its built-in digital clock-calendar, notes that it is 5:00 p.m., and selects a CD filled with romantic music. The thermostat checks its program and decides that the room is a bit chilly. It cranks up the furnace and heat flows into the room.

Everything is working smoothly except for one tiny helper—the semi-intelligent home security alarm that's been caught off guard, since its schedule tells it that no one is supposed to be home on a weekday until 6:00 p.m. "Who goes there?" it booms in a threatening baritone voice.

"Just me, Butch," says the master. "I'm home early. I think I'm catching a cold."

"How do I know it's you?" asks Butch suspiciously. "What's your wife's name?"

"Margaret."

"Wrong!" says Butch, who doesn't realize that the master has remarried and forgotten to inform him. "Intruder alert! Intruder alert! Police are on their way. You have a right to remain silent or request the presence of an attorney."

Things may not get this carried away. But think of how interesting it will be if the appliances in the room not only respond to human cues but also to each other.

Again, enter the master. He sits on Catherine the Couch.

Catherine is intelligent and rearranges her shape to cushion him comfortably. The lights blink on, the fireplace blazes, and the temperature soars.

"Stop! Stop!" yells Frank the Fireplace to Thelma the Thermostat. "I'm supposed to warm the room. If you keep warming it, Ron the Room will tell my sensors to shut me off. The master wants my fire for atmosphere as much as my heat. He'll be really angry if I suddenly switch off."

Thelma the Thermostat is about to make an angry retort, but she is interrupted by Larry the Lamp. "Shut up, Frank!" cries Larry, who is very rude for a lamp. "You don't have any real heat; you're just for show. And take a look at the master. He's got a book in his hand, so he must want to read. Lighting the room for reading is my job."

As the other appliances hear the argument, they join in. Stan the Stairway begins complaining to Ruth the Rug. Catherine the Couch unwinds at Tubby the Table. Wendy the Window starts whining at Dora the Doorknob. Pretty soon, the entire room is filled with the screams and shouts of disgruntled appliances.

In the middle of the room, the master has been dumped on the floor by Catherine, flipped on his back by Ruth, left in the dark by Larry and Frank, and frozen by Thelma. He starts to complain. But his tiny human voice is drowned out by the taunts and threats of the incensed appliances.

This story's moral: It's fine and magical to bring good things to life. Soon, we'll have the technology to do this inexpensively for almost every device in our homes. But maybe there's a limit, beyond which we wave bye-bye to common sense and sanity and say hello . . . to the twilight zone.

It's fine and magical to bring good things to life—but there is a limit.

UMBRELLAS

By Maurice Yanney

Acid raindrops are falling and destroying the plants. In order to provide the vegetation with a temporary measure of protection, you can shield them with a pair of umbrellas. The umbrellas move in unison, so it will take some skill to protect the plants from the rancid rain.

Typing It In

Umbrellas is written entirely in machine language, but it loads and runs like a BASIC program. To type it in, use MLX, our machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts you, respond with the following values.

Starting address: 0801 Ending address: 15A0

Be sure to save a copy of the program before exiting MLX.

Playing the Game

The Umbrella playing screen consists of two umbrellas, a row of 12 seeds near the bottom of the screen, and plants of various heights above the seeds. The top of the screen contains a random number of clouds. The bottom line of the screen displays the number of raindrops remaining in the current level, your extra seeds, your score, and the current level.

You begin with your two umbrellas placed at the far left and far right of the screen. The umbrellas move in unison. To move the umbrellas toward the sides of the screen, use the cursor up/ down key or the = key. If you are using a joystick, move it left or down. To move the umbrellas toward the center, use the cursor left/right key or the 1 (up arrow) key. If you are using a joystick, move it right or up.

The umbrellas will wrap around the screen if moved too far in one direction. If the umbrellas are in the center of the screen and you make another move toward the center, the umbrellas will move to the far sides of the screen. Conversely, if the umbrellas are at the far sides of the screen and vou make another move toward the sides, the umbrellas will move to the center of the screen. This maneuvering is a little tricky at first and will take some time for you to master.

When you move the umbrellas, they position themselves automatically on top of a plant or seed. To prevent a raindrop from destroying part of a plant or a seed, you must shield it with an umbrella. (This is one game where you may find the keyboard more respon-

sive than a joystick.)

If a raindrop hits an umbrella, you receive 50 points, and the drop count is reduced by one. If the raindrop hits a plant, the plant's height is diminished, and the drop count is reduced by one. If the raindrop hits a seed, you lose a reserve seed. Move to a new level when the number of drops reaches 0. When you complete a level, you receive an additional 1000 points. The game ends when a raindrop hits a seed and you have none in reserve.

As you advance to higher levels, the game gets harder. The number of raindrops increases by 5 at each level, beginning with 50 on level 1. You'll notice that the plants don't seem to grow as well on higher levels. You can help improve growth on subsequent levels by leaving the plants on the current level in a good state. The third level adds another dimension of difficulty, and a bonus seed is awarded each 2500 points.

You can pause the game by holding down the Shift key or by pressing the Shift Lock key. Release the Shift key or press the Shift Lock key again to resume play.

UMBRELLAS

Ø801:0B ØB ØA ØØ 9E 20 32 30 A4 Ø809:36 32 ØØ ØØ ØØ A9 ØC 8D ØD Ø811:20 DØ A9 ØF 8D 21 DØ 20 3E Ø819:43 ØE 2Ø 73 ØB 2Ø D8 12 Ø821:20 DA 99 A9 Ø3 8D A2 15 5C Ø829:A9 ØØ 8D AØ 15 8D B5 15 29 Ø831:8D CB 15 8D C7 15 8D C8 EC Ø839:15 8D C6 15 8D C4 15 A9 B4 Ø841:FA 8D C5 15 8D C3 15 20 Ø3 8D A9 15 8D Ø849:E5 ØC A9 8D AC 15 A9 24 8D 9D Ø851:AA 15 8D D2 15 8D 68 Ø859:AB 15 A9 F3 Ø861:D3 15 8D D4 15 20 08 11 E9 Ø869:20 C2 13 20 93 AD a1 FØ ØF AD 8D Ø2 97 Ø871:DC 29 10 Ø879:29 Ø1 C9 Ø1 DØ Ø6 20 16 9C Ø881:15 4C 6F Ø8 AØ 21 20 3C A3 Ø889:ØB 88 DØ D6 15 FØ EE FA AD 15 88 8C Ø891: ØA AC D6 D6 15 37 Ø899:4C 9F Ø8 20 21 15 AD **B5** 29 Ø8A1:15 18 69 Ø1 29 Ø1 8D B5 9D

Ø8A9:15 20 3F 12 20 B5 0C AD F2 Ø8B1:D5 15 FØ Ø3 4C 4E Ø9 AD 9B Ø3 09 Ø8B9:B5 15 FØ 4C 38 A5 07 FØ 35 C9 35 FØ Ø8C1:C5 C9 Ø8C9:31 C9 Ø2 FØ 4D C9 36 FØ aa DC C9 7R Ø8D1:49 AD 77 FØ Ø8D9:C9 7E FØ 3E C9 3 A FØ 16 AD Ø1 DC C9 Ø8E1:C9 7D 2F C9 FB FØ Ø8E9:FE FØ 09 FD FØ 93 4C CI Ø8F1:F7 FØ 27 A9 20 8D B4 15 20 Ø8F9:38 Ø9 Ø9Ø1:D9 11 38 AD A9 15 93 9999:8D A9 15 18 AD 15 69 Ø911:03 8D AB 15 20 08 20 A9 20 8D B4 4A 0919:38 09 15 Ø921:D9 11 18 AD A9 15 69 03 B9 15 38 AD AB 15 E9 Ø929:8D A9 20 98 Ø931:03 8D AB 15 D5 15 FØ 03 4C 0939:B5 ØC AD Ø941:4E Ø9 20 8D B4 15 A9 0949:08 11 4C 6F Ø8 20 Ø951:AØ 00 B9 CØ 09 99 BØ 04 Ø5 99 BØ D8 C8 A9 F9 Ø959:A9 Ø961:99 BØ Ø4 A9 Ø2 99 0969:20 43 ØB CØ 09 DØ E3 A9 ØØ B9 C9 0971:20 99 BØ Ø4 AØ 0979:09 99 24 95 A9 95 05 99 Ø981:D9 C8 A9 F9 24 98 24 D9 20 ØB CØ 0989:02 99 43 GA Ø991:11 DØ E3 A9 20 99 0999:AD 00 DC C9 7F FØ 89 91 DC C9 09A1:1E 08 AD 1E Ø8 A5 C5 C9 19 85 09A9:03 4C Ø9B1:DØ Ø3 4C 1E Ø8 C9 97 Ø9B9:DF 20 16 15 20 E2 65 12 Ø9C1:01 0D 05 20 0F 16 20 09C9:10 0C al 19 Ø9D1: Ø9 ØE 3F 20 28 19 2F ar F. 7 Ø9D9:29 A9 FF AØ 99 CØ Ø9E1:C8 DØ FA A9 05 A0 2A C8 DØ FA A9 FE AØ EA 09E9:E9 DA 06 Ø9F1:DA 99 Cl C8 aa B9 Ø9F9:FE DØ F6 AØ CØ 28 DØ F5 ØAØ1:99 Ca 97 C8 ØAØ9:60 FD ØF 10 13 3A 94 12 ØA11:30 30 FD FC FC FC 20 15 ØA19:20 20 20 20 20 20 20 FD 30 30 30 30 30 ØA21:30 ØA29:0C Ø5 16 05 ØC 3A BØ ØA31:FD AD AF 15 85 FR AD FC A9 FB AØ 91 91 69 ØA39:15 85 14 A9 05 91 FD 59 ØA41:FB 20 D1 91 91 FD C8 9A49:C8 15 11 @A51:AD 15 E5 FB 8D R3 AD ØA59:AE 15 E5 FC ØD **B3** 20 E8 14 A9 ØA61:16 FR A9 58 C8 91 ØA69:91 FB A9 FA 91 ØA71:F8 C8 FB 4C 42 ØA ØA79:20 El 14 A9 97 85 FC A9 85 FB AC A2 15 Bl FR ØA81:A1 99 07 ØA89:8D B3 15 A9 FE 37 15 CD ØA91:18 A9 A1 6D A2 38 AD B3 AE A 2 38 ØA99:15 BØ 75 ØAA1:15 9D A1 07 8A 18 ØAA9:CD B1 15 FØ 62 BD A1 07 17 A9 FE 9D Al 97 6F @AR1:8D **B3** 15 ØAB9:8E D5 15 20 4E 15 AE D5 ØAC1:15 20 43 ØB A9 00 8D D5 BF ØAC9:15 AD B3 15 9D Al 07 E8 ØAD1:4C A5 ØA AD B3 15 AC A2 7F

12D9:00 12E1:05 12E9:D0 12F1:C3 12F9:ED 1301:18 1309:C3 1311:8D 1319:F0 1321:18 1329:AC 1331:4E 1339:AD	C4 14 69 A2 15 A2	1851C5D17D68555B9665B8C75BB265DF4CCD9659B8C8B20006B53D501595	1511AADØCABOØ15F0Ø12F0Ø12F0Ø15F0Ø155552F5999996883D54AD3D99996883D54AD3D909996883D54AD3D909996883D54AD3D909996883D54AD3D909996883D54AD3D909996883D54AD3D909996883D54AD3D909996883D54AD3D909996883D54AD3D909996883D54AD3D909996883D54AD3D909996883D54AD3D909996883D54AD3D909996883D54AD3D9099996883D54AD3D9099996883D54AD3D909999999999999999999999999999999999	A5 FFD 9 2 38 2 2 8 5 5 4 C 9 9 D 1 5 3 A 4 Ø 9 P D 1 5 A 2 5 C A Ø Ø A 5 C A Ø Ø Ø A 5 C A Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø	15 AD 15 Ø7 ØØ DØ	C9 A2 A9 60 91 06	ØC 15 FC 2Ø FB A9	33B311D0E812A699E57C23FD007C1D88EB7B78E6ECCCFA93TA595DD0FF7905DD0CD1B88E7B785E6CCCFA933TA595DD0FF7
12F1:C3 12F9:ED 13Ø1:18 13Ø9:C3 1311:8D 1319:FØ 1321:18 1329:AC 1331:4E	15 C4 AD 15 C4 14 69 A2 15 A2 8D 20 69 38 15 AF 15 AF	8D 15 C3 AD 15 20 01 15 A9	B3 ØD 15 C4 AD 33 8D 99 20	15 B3 6D 15 A2 15 A2 C9 A0	AD 15 C5 6D 15 AD 15 07	C8 90 15 C6 C9 A2 A9 60 91	15 2E 8D 15 ØC 15 FC 20 FB	30 FA A2 59 B5 AD 60 D5

1399:BØ 17 20 E1 14 A9 FB C8 Ø8 13A1:91 FB A9 20 C8 91 FB 20 6B 13A9:D1 14 A9 Ø5 91 FD 4C BE 1F 13B1:13 20 B5 14 20 E1 14 C8 DA 13B9:91 FB C8 91 FB 20 9D 14 89 13C1:60 20 97 E0 A5 8F 29 07 E5 13C9:C9 Ø6 BØ F5 8D A5 15 18 13D1:6D A5 15 6D A5 15 69 7B 61 13D9:8D A5 15 A9 Ø4 8D A6 15 26 13E1:38 AD A5 15 ED A7 15 8D 13E9:B3 15 AD A6 15 ED A8 15 16 13F1:0D B3 15 F0 CC 20 97 E0 34 13F9:A5 8F 29 ØF 69 Ø1 8D CE 1401:15 60 20 97 E0 A5 8F 29 2F 1409:07 C9 06 B0 F5 8D A3 15 35 1411:18 6D A3 15 6D A3 15 69 F3 1419:8D 8D A3 15 A9 04 8D A4 4E 1421:15 38 AD A3 15 ED A7 15 96 1429:8D B3 15 AD A4 15 ED A4 7C 1431:15 0D B3 15 F0 CC 20 97 81 1439:EØ A5 8F 29 ØF 69 Ø1 8D 6D 1441:CD 15 60 20 97 E0 20 97 BB 1449:EØ A5 8F 29 ØF C9 ØB BØ 36 1451:F2 8D A7 15 18 6D A7 15 77 1459:6D A7 15 69 7B 8D A7 15 D1 1461:A9 Ø4 8D A8 15 38 AD A5 26 1469:15 ED A7 15 8D B3 15 AD FØ 1471:A6 15 ED A8 15 ØD B3 15 D3 1479:FØ C9 38 AD A3 15 ED A7 1481:15 8D B3 15 AD A4 15 ED 77 1489:A8 15 ØD B3 15 FØ B4 20 1E 1491:97 EØ A5 8F 29 ØF 69 Ø1 C4 1499:8D CF 15 60 38 AD A1 15 F5 14A1:E9 Ø1 8D A1 15 20 C2 10 89 14A9:AD A1 15 C9 00 F0 01 60 76 14B1:20 53 0B 60 20 E1 14 C8 9F 14B9:91 FB C8 91 FB 20 E8 14 22 14C1:60 B9 A3 15 85 FB B9 A4 14C9:15 85 FC AØ ØØ A9 2Ø 6Ø CE 14D1:18 A5 FB 69 00 85 FD A5 3D 14D9:FC 69 D4 85 FE AØ 00 60 A8 14E1:A9 20 A0 00 91 FB 60 18 50 14E9:A5 FB 69 28 85 FB A5 FC F7 14F1:69 00 85 FC 60 A9 16 8D B2 14F9:01 D4 A9 41 8D 04 D4 A9 F0 1501:0F 8D 05 D4 A9 E6 8D 06 0E 1509:D4 60 A9 0F 8D 18 D4 A9 FB 1511:05 8D D6 15 60 A2 19 A9 B6 1519:00 9D FF D3 CA DØ FA 60 D7 1521:AD B5 15 DØ Ø9 20 F6 14 ØA 1529:A9 ØB 8D 18 D4 6Ø 2Ø 16 9C 1531:15 60 A9 C8 8D 01 D4 A9 83 1539:13 8D 04 D4 A9 09 8D 05 AF 1541:D4 A9 ØF 8D Ø6 D4 20 ØB C9 1549:15 20 43 ØB 60 8A 8D 01 68 1551:D4 A9 83 8D 04 D4 A9 00 60 1559:8D Ø5 D4 A9 FØ 8D Ø6 D4 5F 1561:20 ØB 15 20 3C ØB A9 ØØ 64 1569:8D D6 15 20 16 15 60 A9 24 1571:0A 8D 01 D4 A9 83 8D 04 EB 1579:D4 A9 ØØ 8D Ø5 D4 A9 7F 1581:8D 06 D4 20 0B 15 60 A9 A7 1589:01 8D 01 D4 A9 83 8D Ø4 7F 1591:D4 A9 00 8D 05 D4 A9 7F B7 1599:8D 06 D4 20 0B 15 60 00 16

Maurice Yanney, the author of Cats and Mice (January 1993), tends his garden in Lebanon, Pennsylvania.

STEPMAN

By David Williams

Stepman is a simple game for the 128 in 40-column mode that's designed to improve a child's spelling. The game includes colorful animated graphics, music, and sound effects.

Entering the Program

Stepman consists of two parts: the main program and sprite data. The main part is written entirely in BASIC. To help avoid typing errors, enter it with The Automatic Proofreader. See "Typing Aids" elsewhere in this section. Be sure to save a copy of the program before exiting Proofreader.

The second part is data for Stepman's sprites. Enter this part of the program with MLX, our machine language entry program. See "Typing Aids" again. When MLX prompts, respond with the following values.

Starting address: 0E00 Ending address: 0FFF

Be sure to save this data with the filename STEPMAN.SPR. The main program looks for and loads this filename when it runs.

A Helping Hand

Stepman is a very tiny person. In order to make it to his girlfriends' house by lunchtime, he must get to the top of a very large staircase. It's way too large for him to climb, but fortunately he's a champion high jumper at school. This is where you come in. At every step, Stepman is presented with a word that may or may not be spelled correctly. You must type in the correct spelling in order to help him on his upward journey. If you spell the word correctly, he'll be able to jump to the next higher step. Spell it incorrectly, and he'll fall back one step, bruising a sensitive spot of his anatomy.

Once Stepman has reached the top of the staircase, he'll be very grateful to you for your invaluable aid. He'll jump for joy and ask if you'd like to play again.

When you're entering a word, use the Del key to correct any mistakes you may make. An invalid keypress will cause a bell to ring. Use the Return key when you believe you've entered the word correctly.

The words that the program uses are listed in data statements. These can be modified at any time. Remember, however, to enter a pair of words for each entry: one with a common spelling mistake and the other spelled correctly. Of course, you could make an entry with both words spelled correctly if you wish.

Stepman can be used for situations other than spelling. The words could be replaced with atomic elements to help you study for a chemistry test.

Stepman also has a Help function that contains brief instructions. It can be called at any time by pressing the 128's Help key.

STEPMAN

- SQ 0 FAST:BLOAD"STEPMAN.SPR":I =RND(-TI):CLR:GRAPHIC.:RE STORE:SYS24812,,9,,,CHRS(27)+"H":COLOR.,12:COLOR4, 16:FORI=2TO7:SPRITEI,.:NE XT:SPRITE1,1,16,...,.:T EMPO6
- DR 1 W=49:DIMS,J,A\$,B\$,C\$,S\$,A \$(W-1),C\$(W-1):FORI=.TOW-1:READA\$(I),C\$(I):NEXT
- XB 2 PRINT"{2 HOME}{CLR}{BLK}
 {N}{RVS}STEPMAN
 {10 SPACES}DM WILLIAMS &
 {SPACE}SR PATTON":PRINTTA
 B(8)"{DOWN}{3}EASY STEPS
 {SPACE}TO SPELLING!
- JJ 3 PRINTTAB (7) "{YEL}COMPUTE {SPACE}PUBLICATIONS 1993" :PRINTTAB (6) "PROGRAMMING {SPACE}: DAVID WILLIAMS": PRINT" {2 DOWN} {6} YOU MUST HELP STEPMAN CLIMB UP AL L THE
- RR 4 PRINT"STAIRS. TO DO THIS,
 YOU ARE GIVEN A":PRINT"S
 ERIES OF WORDS, WHICH MAY
 OR MAY NOT BEMISSPELT. Y
 OU ARE TO TYPE IN THE COR
 RECTSPELLING, AND IF YOU
 {SPACE}ARE CORRECT,
- SQ 5 PRINT"STEPMAN WILL CLIMB {SPACE}UP A STAIR, OTHERW ISEHE WILL FALL BACK DOWN ONE !!":SPRITE8,.,16,.,1,.:MOVSPR8,150,170
- BJ 6 GRAPHIC1,1:COLOR1,2:FORI= 12TO24:FORJ=1TO40-3*(24-I):CHAR1,40-J,I," ",1:NEXT:NEXT
- GG 7 COLOR1,1:CHAR1,.,.,"STEPM
 AN{10 SPACES}DM WILLIAMS
 {SPACE}& SR PATTON",1:COL
 OR1,11:CHAR1,31,24,"STEP

- CHAR1,15,2,"{10 SPACES}":
 CHAR1,.,3,"{40 SPACES}":
 HAR1,2,4,"{35 SPACES}"
 MH 9 S=.:GOSUB30:PLAY"V104T7U8
- MH 9 S=.:GOSUB30:PLAY"V104T7U8
 X0V204T0U8X0V2011AV103IEV
 202QAV103SA04C03BEV2021#G
 V103SB04DV104ICV202SAEMV1
 04IEV202SA03CV103I#GV202S
 BEV104IEV202SB03D
- QJ 10 PLAY"V203ICV103SAEV202IA V103SA04CV202I#GV103SBEV 202IEV103SB04DV104ICV202 SAEV103IAV202SA03CV104QR V202SBEB03D
- SB 11 CHAR1,.,2,"YOUR WORD IS {SPACE}:":CHAR1,.,3,"HOW DO YOU SPELL THIS CORRE CTLY?
- RQ 12 I=INT(RND(.)*W):A\$=A\$(I)
 :C\$=C\$(I):IFRND(.)<.1THE
 NA\$=C\$
- GM 13 CHAR1,15,2,"{15 SPACES}"
 :CHAR1,15,2,A\$:CHAR1,1,4
 ,"{@}":B\$=""
- SC 14 GETKEYSS: IFS\$=CHR\$ (27) TH ENGETS\$: IFS\$="H"THENGRAP HIC.:SPRITE1,.:SPRITE8,1 :GETKEYS\$: GETS\$: GRAPHIC1 :SPRITE8,.:SPRITE1,1:GOT 014
- AE 15 IFS\$=CHR\$(20)ANDLEN(B\$)>
 .THENB\$=LEFT\$(B\$, LEN(B\$)
 -1):CHAR1, LEN(B\$)+1,4,"
 {@} ":GOTO14
- CG 16 IFS\$=CHR\$(13)THENCHAR1,L EN(B\$)+1,4," ":GOTO18:EL SEIFS\$<"A"ORS\$>"Z"THENPR INT"{G}":GOTO14
- CQ 17 B\$=B\$+S\$:CHAR1,LEN(B\$),4
 ,S\$+" {@}":GOTO14
- EQ 18 IFB\$=C\$THENBEGIN:CHAR1,1
 5,7,"WELL DONE!":SOUND2,
 20000,50,.2000,100:SPRS
 AV2,1:FORJ=1TO10:MOVSPR1
 ,+2,-1:NEXT:SLEEP.5:SPRS
 AV3,1:FORJ=1TO2:MOVSPR1,
 +1,+1
- RD 19 NEXT:MOVSPR1,+2,+.:SPRSA
 V8,1:S=S+1:GOSUB30:IFS=1
 2THENSPRSAV7,1:FORI=1TO3
 :FORJ=1TO15:MOVSPR1,+.,1:NEXT:SLEEP.5:FORJ=1TO1
 5:MOVSPR1,+.,+1:NEXT:NEX
- RS 20 CHAR1,15,7,"{10 SPACES}"
 :BEND
- RC 21 IFB\$<>C\$ANDS>.THENBEGIN:
 CHAR1,17,7,"OOPS!":SOUND
 2,49152,70,1,..100,1,.:S
 LEEP.5:SPRSAV4,1:MOVSPR1
 ,-2,+.:FORJ=lTO2:MOVSPR1
 ,-1,-1:NEXT:SLEEP.5:SPRS
 AV5,1
- GA 22 FORJ=lTo1Ø:MOVSPR1,-2,+1
 :NEXT:SLEEP.5:SPRSAV6,1:

- SLEEP1:SPRSAV8,1:S=S-1:G OSUB30:CHAR1,17,7," {5 SPACES}":BEND
- HB 23 CHAR1,1,4,"{14 SPACES}": IFS<12THENGOTO12
- KH 24 CHAR1,.,2,"{15 SPACES}WE LL DONE!":CHAR1,.,3,"YOU HAVE HELPED STEPMAN CLI MB THE STAIRS
- DF 25 PLAY"V203ICV104SREV202IA V104SCEV203ICV103SA04CV2 02IAV102SEGV103IFV203SD0 2AV103IAV202SFAV104IFV20 1SA02C
- BH 26 PLAY"V201IFV104SC03AV201
 IDV103SFAV103IDV201SG02G
 V103IBV202SFGV201IAV104S
 C03AV202I#FV104SCEV201IB
 V104SD03BV202I#GV104SDF
- SP 28 PLAY"V2021#GV104SBDV2021 AV104SCAV2021DV104SFDV20 21EV103SB04DV2021FV103S# GBV2021#DV104SC03AV2021E V103SEAV2021EV103SB#GV20 1HAV103SAECE020A
- EB 29 SLEEP2:CHAR1,2,4,"WOULD {SPACE}YOU LIKE TO PLAY {SPACE}AGAIN? (Y/N)":POK E208,.:GETKEYA\$:IFA\$="Y" THENGOTO8:ELSESPRITE1,.:GRAPHIC.:PRINT"{CLR}GOOD BYE!":END
- QB 31 MID\$(S\$,2,1)=CHR\$(ASC("Ø ")+J):CHAR,38,24,S\$,1:CO LOR1,8:RETURN
- JQ 32 DATAWURD, WORD, BLUD, BLOOD , BISKIT, BISCUIT, CIRKIT, C IRCUIT, DISPARE, DESPAIR, P ROFFESOR, PROFESSOR, ENDEV ER, ENDEAVOUR, WALLNUT, WAL NUT, DISDANE, DISDAIN, KONV OY, CONVOY
- CB 33 DATASELEBRAITION, CELEBRA
 TION, WENDSDAY, WEDNESDAY,
 DREEM, DREAM, CAPTIN, CAPTA
 IN, GAURD, GUARD, COOKOO, CU
 CKOO, BAISIN, BASIN, BASAUL
 T, BASALT, PEECH, PEACH, CLE
 ER, CLEAR
- PH 34 DATAMEENING, MEANING, PERF ORMENSE, PERFORMANCE, INVE STAGATE, INVESTIGATE, THON DER, THUNDER, NECESARY, NEC ESSARY, LURN, LEARN, NURV, N ERVE, TURM, TERM, FORTEEN, F OURTEEN
- RA 35 DATASIMALAR, SIMILAR, SATE RDAY, SATURDAY, SESON, SEAS ON, JELY, JELLY, COMAND, COM

MAND, CONSTELATION, CONSTE LLATION, BUSINES, BUSINESS , DIFICULT, DIFFICULT, HARB OR, HARBOUR

AA 36 DATACHALLANGE, CHALLENGE, INTELLAGANT, INTELLIGENT, DUPLICAIT, DUPLICATE, PEEP LE, PEOPLE, AMUSMENTS, AMUS EMENTS, SPESHEL, SPECIAL, B UTEY, BEAUTY, LISSEN, LISTE

DJ 37 DATADISTANS, DISTANCE, CAM
ARA, CAMERA, CHOCLET, CHOCO
LATE

STEPMAN.SPR

ØEØØ:03	F8	00	04	04	ØØ	Ø8	92	DE
ØEØ8:00	08	22	ØØ	08	72	00	04	78
ØE10:04	ØØ	Ø3	F8	00	ØE	07	00	64
ØE18:1A	05	80	31	04	CØ	18	84	7D
ØE20:60	ØC	44	30	00	FF	ØØ	01	FB
ØE28:C3	80	Ø3	81	CØ	07	ØØ	EØ	Cl
ØE3Ø:ØE	ØØ	EØ	1C	01	CØ	38	Ø3	AF
ØE38:80	70	07	ØØ	ØØ	ØØ	ØØ	ØØ	91
ØE40:03	F8	ØØ	Ø4	04	ØØ	Ø8	92	1F
ØE48:00	Ø8	22	00	Ø8	72	ØØ	04	B8
ØE50:04	ØØ	03	F8	ØØ	ØE	Ø7	ØØ	A4
ØE58:1A	Ø5	80	31	04	D8	30	84	4E
ØE60:60	18	44	ØØ	ØØ	FF	00	Ø1	3C
ØE68:C3	80	03	81	CØ	Ø3	80	EØ	F2
ØE70:07	Øl	CØ	ØE	Ø3	80	1C	07	A2
ØE78:00	38	ØE	00	ØØ	ØØ	00	ØØ	64
ØE80:00	ØØ	00	03	F8	00	04	04	AØ
ØE88:00	Ø8	92	00	Ø8	22	00	08	C9
ØE90:72	ØØ	04	04	ØØ	03	F8	00	A4
ØE98:ØE	07	00	1A	Ø5	ВØ	31	04	70
ØEAØ:EØ	18	84	00	ØC	44	00	00	35
ØEA8:FF	ØØ	01	C3	80	03	81	CØ	F4
ØEBØ: Ø3	81	CØ	Ø3	83	80	07	07	2A
ØEB8:00	ØE	ØE	00	1C	1C	00	00	6B
ØECØ:03	F8	00	04	04	00	08	92	9F
ØEC8:00	Ø8	22	ØØ	08	72	00	04	39
ØEDØ: Ø4	00	Ø3	F8	00	ØE	07	100	25
ØED8:1A	Ø5	BØ	31	04	EØ	60	84	55
ØEEØ:ØØ	CØ	44	00	00	FF	00	01	B6
ØEE8:C3	80	01	Cl	CØ	03	80	EØ	37
ØEFØ: Ø7	00	70	ØE	00	EØ	1C	01	3C
ØEF8:CØ	38	03	80	00	00	00	00	EB
ØFØØ:03	F8	99	04	04	00	Ø8	92	EØ
ØFØ8:ØØ ØF1Ø:Ø4	00	22 Ø3	ØØ F8	Ø8 3Ø	72 ØE	00	60	7A 48
ØF18:DA	05	80	71	04	00	00	84	BØ
ØF20:00	00	44	ØØ	00	FF	00	01	C7
ØF28:C3	80	Øl	Cl	CØ	00	EØ	EØ	2D
ØF30:00	70	70	ØØ	38	38	ØØ	1C	37
ØF38:1C	00	ØE	ØE	ØØ	ØØ	00	99	07
ØF40:00	00	ØØ	00	ØØ	ØØ	ØØ	ØØ	5E
ØF48:00	ØØ	ØØ	00	ØØ	90	00	00	66
ØF50:00	00	-	FØ	ØØ	08	Ø8	ØØ	8E
ØF58:11	24	00	10	44	00	10	E4	30
ØF60:00	08	Ø8	00	07	Fl	CE	9C	BB
ØF68:ØF	9C	B4	07	38	E2	ØE	70	16
ØF70:01	10	EØ	00	BD	CØ	01	FF	25
ØF78:80	00	E7	00	ØØ	00	00	00	D3
ØF8Ø:03	F8	00	04	04	00	Ø8	92	61
ØF88:00	08	22	10	88	72	30	C4	21
ØF90:04	60	63	F8	CØ	3E	Ø7	80	52
ØF98:02	04	00	Øl	04	00	00	84	6D
ØFAØ:00	ØØ	44	00	00	FF	ØØ	Øl	48

ØFA8:C3	80	Ø3	81	CØ	07	00	EØ	44
ØFBØ: ØE	ØØ	70	1C	00	38	38	ØØ	F6
ØFB8:1C	70	00	ØE	00	00	00	00	El
ØFCØ: 03	F8	00	04	04	ØØ	Ø8	92	A1
ØFC8:00	08	22	00	Ø8	72	00	04	3B
ØFDØ: 04	ØØ	03	F8	ØØ	ØE	07	00	27
ØFD8:1A	Ø5	80	31	04	CØ	18	84	40
ØFEØ:60	ØC	44	30	00	FF	00	01	BE
ØFE8:C3	80	Ø3	81	CØ	07	ØØ	EØ	84
ØFFØ: ØE	ØØ	EØ	1C	01	CØ	38	03	72
ØFF8:80	70	07	ØØ	ØØ	ØØ	00	00	54

David Williams is the author of Hangman 128, Typing Tutor, and Mega Adventure. He lives in Charlestown, New South Wales, Australia.

POWERSPRITE

By Danny English

If you've ever used sprites in your own programs, you know how time consuming they can be. Setting their colors, expansion, coordinates, and other pointers can be tedious.

Powersprite, a program for the 64, makes setting up sprites a snap. A simple onscreen editor allows total control over all sprite registers. You can then save the data to disk for use in your own programs.

Many programs require graphics larger than a single sprite. Connecting sprites and moving them together can be a serious task, but Powersprite makes that chore easy. Powersprite lets you connect up to eight sprites to form one giant powersprite, which can be moved or animated with a single command. All you have to do is draw the sprites!

Getting Started

Powersprite is written entirely in machine language. All codes and data reside in memory locations \$C000-\$C6FF. A demonstration is included as an example of how to use Powersprite in a BASIC program. Since Powersprite doesn't draw sprite shapes, they must be drawn using a sprite editor, such as COMPUTE's Sprite Magic. Powersprite is compatible with almost any sprite editor if the sprite data can be loaded into bank 0.

You must enter Powersprite with MLX, our machine language entry program; see "Typing Aids" elsewhere in this section. When MLX prompts, respond with the following.

Starting address: C000

Ending address: C6FF

Be sure to save a copy of the program with the filename POWERSPRITE before you exit MLX. This is the filename that the demonstration program loads when it runs.

The demo program is written entirely in BASIC. To help avoid typing errors, enter it with The Automatic Proofreader; see "Typing Aids" again. Be sure to save it on the same disk as the Powersprite program. By running the demo and following its code, you'll have a good idea of how to use Powersprite commands.

The Editor

To use Powersprite, load it with the ,8,1 extension and then enter *NEW*. Next, load your sprites. To enter the editor, type *SYS 49152*. You will be prompted about how many sprites to connect. If you don't wish to create a powersprite, press 0 to skip that option.

If you are making a powersprite, press 1 through 8, depending on the number of sprites you want to connect. The editor commands will now appear at the top of the screenwith a block of sprites below them. The commands are similar to those of other sprite editors. Press X or Y to expand, O to turn sprites off or on, and so on. Press the key again to undo that command.

The current sprite being set is displayed in gray in the upper left corner of the screen. To select another sprite, press keys 0–7. If you select a sprite that isn't enabled, simply press O to turn it on.

Use the cursor keys to move individual sprites. Sprites can be moved anywhere on the screen. Multiple sprites can be connected in any way to form a powersprite. The @ / : ; keys move a defined powersprite up, down, left, or right, respectively. For example, if you define four sprites to be connected, sprites 0–3 would move together as one powersprite.

Pressing the + or - keys will increment or decrement the frame of an individual sprite. All sprite frames default to 192, meaning sprite data is stored at 12288. Please see the animation section below for details on powersprite frames.

To edit the colors on an individual

sprite, press C. A new menu will appear that will let you set sprite and background colors using keys 1–4. All three sprite colors can be accessed only if the sprite is in multicolor mode.

When all sprites are in place, press Q to quit the editor. You will then be prompted to save your data to disk or abort. If you choose to abort but change your mind a short time later, don't worry. The data will still be stored in memory. At anytime after quitting, you can enter the editor again, and all sprites will remain intact for further editing. If you choose to save to disk, you will be prompted for a filename. A copy of the code is stored along with your custom data. A saved file will function independently of the original Powersprite program.

Storing and Recalling

In some cases, you may wish to set up your sprite display manually using POKEs and PEEKs, or you may wish to leave it under program control. To take a snapshot of all sprite registers, type SYS 49155. If you wish to define a powersprite, enter POKE 49192, N where N is the number of sprites connected. To store the snapshot on disk, simply enter SYS 50754.

To recall your stored sprite registers, load your saved file. Enter SYS 49158, and the sprites will appear exactly as you positioned them. If you decide to make any more changes, simply enter SYS 49152 to use the editor again.

Powerful Sprites

The most advanced feature of Powersprite allows you to move and animate multiple sprites. To move a powersprite, it should first be displayed using the RECALL command. The format for moving a powersprite is SYS 49164, X, Y, M. The X and Y values correspond to the x and y coordinates of sprite 0. All other sprites will be moved respective to these values. The legal limits of X and Y are 0 to 255. To move beyond the 255th X position, set X back to 0 and M to 1. When you set M to 1, the program will automatically add 255 in the x-axis to each sprite that is beyond that range. For example, to move a powersprite to location 265, 100, the command would be SYS 49164, 10, 100, 1.

Limitations

There are restrictions when manipulating a powersprite. First, don't move a powersprite more than 255 positions at a time. The program won't add or subtract a value greater than 255.

Second, be careful when moving larger powersprites off the border. Some of the sprites may wrap around, causing unwanted effects. If your powersprite does wrap around, simply move it back in the opposite direction a few times. Any other sprites on the screen won't be disturbed by a powersprite.

Animation

Animating a powersprite is much like animating a normal sprite. The only difference is that one frame of a powersprite may consist of up to eight normal sprite frames. To set the frame of a powersprite, enter *SYS 49161*, *F* where *F* is the starting frame number. Legal frame values range from 0 to 255. For example, if you enter 192 for *F* and three sprites have been defined as a powersprite, sprite 0 will point to 192, sprite 1 to 193, and sprite 2 to 194. The next frame should start at 195. Designing correct frames should be done using a good sprite editor.

A moving animated powersprite can produce a high-speed, commercial-quality display. Whether you're making a giant animated dragon for an adventure game or just setting up a simple sprite display, Powersprite will make it a lot less painful.

POWERSPRITE

C000:4C	40	CØ	4C	43	CØ	4C	46	90	
C008:C0	4C	49	CØ	4C	4C	CØ	00	47	
CØ10:85	7C	9D	7C	B5	7C	CD	7C	A6	
CØ18:85	91	9D	91	B5	91	CD	91	AE	
CØ20:00	45	4C	45	43	FF	20	00	2B	
CØ28:08	00	00	00	00	00	F2	F3	87	
CØ3Ø:F1	F1	Fl	F1	Fl	F1	Fl	Fl	B1	
CØ38:CØ	CØ	B9							
CØ40:4C	43	C3	4C	34	C2	4C	7F	BA	
CØ48:C2	4C	FB	C4	4C	18	C5	00	64	
CØ50:50	4F	57	45	52	53	50	52	DF	
CØ58:49	54	45	20	20	20	20	20	20	
CØ60:13	12	9B	53	50	52	49	54	4B	
CØ68:45	20	20	05	20	5B	30	2D	E4	
CØ7Ø:37	5D	20	53	45	4C	45	43	47	
CØ78:54	20	20	5B	40	2F	3A	3B	54	
CØ80:20	43	52	53	52	5D	20	4D	F7	
CØ88:4F	56	45	20	20	20	5B	2B	55	
CØ90:2D	5D	20	46	52	41	4D	45	DF	
CØ98:2Ø	20	20	5B	58	59	5D	20	EE	
CØAØ:45	58	50	41	4E	44	20	20	DC	
CØA8:20	5B	4F	5D	46	46	2F	4F	C9	

CØBØ: 4E 2Ø 2Ø 2Ø 2Ø 2Ø 5B 4D EC CØB8:5D 55 4C 54 49 43 4F 4C 4F CØCØ:4F 52 2Ø 2Ø 2Ø 5B 43 5D D6 C0C8:4F 4C 4F 52 20 20 20 5B 31 CØDØ:51 5D 55 49 54 2F 53 41 CØD8:56 45 20 20 13 12 9B 20 15 CØEØ:53 5Ø 52 49 54 45 2Ø 20 17 CØE8:20 Ø5 20 2D 20 98 50 52 COFO: 45 53 53 20 31 2D 34 20 10 CØF8:46 4F 20 43 52 4F 4C 4F C100:52 20 20 5B 51 5D 55 49 62 C108:54 05 20 5B 31 5D C110:50 52 49 54 45 20 43 4F 3F C118:4C 4F 52 20 20 20 20 20 C120:5B 32 5D 20 4D 55 4C 54 38 C128:49 43 4F 4C 4F 52 20 23 F6 C130:31 20 20 5B 33 5D 20 C138:55 4C 54 49 43 4F 4C C140:52 20 23 32 20 20 20 20 5E C148:5B 34 5D 20 42 41 43 4B C150:47 52 4F 55 4E 44 20 20 2F C158:20 20 93 12 05 20 45 4E 20 4F C160:54 45 52 20 23 46 C168:20 53 50 52 49 54 45 53 C170:20 54 4F 20 43 4F 4E 4E 47 C178:45 43 20 54 28 31 2D 38 C180:29 3F 20 20 20 93 12 05 E6 C188:20 53 41 56 45 20 54 4F C190:20 9B 44 05 49 53 4B C198:4F 52 20 9B 41 Ø5 42 4F ClA0:52 54 3F 20 20 20 20 20 C1A8:20 20 20 20 20 20 20 20 C1B0:20 20 20 20 20 93 05 92 3E C1B8:46 49 4C 45 4E 41 4D 45 C1C0:3A 20 AØ ØØ B9 60 CØ C1C8:D2 FF C8 CØ 7D DØ F5 AD A3 C1D0:22 C2 18 69 BØ 8D Ø7 04 7D C1D8:60 A0 B9 DC 00 CØ 20 4D C1E0:FF C8 C0 7E D0 F5 AD 22 72 ClE8:C2 18 69 BØ 8D Ø7 04 60 FC C1F0:A0 00 B9 20 D2 5A Cl FF C1F8:C8 CØ 2B DØ F5 6Ø AØ C200:B9 85 C1 20 D2 FF C8 C0 E6 C208:2F DØ F5 60 A0 00 B9 B5 C210:C1 20 D2 FF C8 C0 0D D0 C218:F5 60 01 02 04 08 10 20 71 C220:40 80 00 01 A9 14 8D 4F C228:CØ A2 ØØ CA DØ FD CE 4F CE C230:C0 D0 F8 60 A0 00 B9 00 E7 C238:DØ 99 10 C0 C8 C0 11 DØ C240:F5 AD 15 DØ 8D 25 CØ AD ØC C248:17 DØ 8D 27 CØ AD 1B DØ 75 C250:8D 2B C0 AD 1C DØ 8D 2C C258:CØ AD 1D DØ 8D 2D CØ AØ C260:00 B9 27 D0 99 30 C0 B9 C268:F8 07 99 38 CØ C8 CØ 08 C270: DØ EF AD 25 DØ 8D 2E CØ 3C C278:AD 26 DØ 8D 2F CØ 60 20 AE C280:C0 C2 AD 25 CØ 8D 15 DØ C288: AD 27 CØ 8D 17 DØ AD 2B C290:C0 8D 1B D0 AD 2C C0 8D 77 C298:1C DØ AD 2D CØ 8D 1D DØ C2A0: A0 00 B9 30 C0 99 27 D0 3C C2A8: B9 38 CØ 99 F8 Ø7 C8 CØ 91 C2B0:08 D0 EF AD 2E C0 8D 25 C2B8: DØ AD 2F CØ 8D 26 DØ 6Ø C2CØ: AØ ØØ B9 10 CØ 99 ØØ DØ ØC C2C8:C8 CØ 11 DØ F5 6Ø 20 C2DØ:C1 20 E4 FF C9 2F BØ Ø3 4B

C2D8:4C D1 C2 C9 39 90 03 4C 4C

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C2E0:D1			30			38	E9	A6
C2E8:30	8D	28	CØ	A9	Øl	8D	15	7C
C2FØ:DØ	AC	28	CØ	88	CØ	00	FØ	53
			200					
C2F8:ØE	18	B9	1A	C2	6D	15	DØ	2B
		DØ	88	4C	F5		60	56
C300:8D	15					C2		
C308:A9	FF	8D	15	DØ	60	BD	00	EA
C310:D0	2D	23	C2	CD	23	CZ	FØ	4D
C318:0D	AD	23	C2	18	7D	00	DØ	A9
							CO SHOW	
C320:9D	00	DØ	4C	60	C3	BD	00	E2
C328:DØ	38	ED	23	C2	9D	00	DØ	73
C330:4C	60	C3	A2	00	AC	22	C2	52
C338:CØ	99	DØ	01	60	E8	E8	88	4B
C340:4C	38	C3	A9	93	20	D2	FF	Dl
		8D	20	DØ	A9	06	8D	El
C348:A9								
C350:21	DØ	20	7F	C2	20	CE	C2	8F
	aa							
C358:A2	00	8E	22	C2	20	C2	Cl	03
C360:AC	22	C2	B9	1A	C2	8D	23	D4
C368:C2	20	E4	FF	C9	38	90	29	6F
C370:C9	58	FØ	39	C9	59	FØ	3A	74
C378:C9	4D	FØ	3B	C9	4F	FØ	3C	B3
C380:C9	51	FØ	3D	C9	2B	FØ	3C	4C
C388:C9	2D	FØ	47	C9	43	FØ	06	16
C390:20	E2	C3	4C	60	C3	4C	BD	86
						- 14		
C398:C4	C9	30	BØ	03	4C	70	C3	F3
C3A0:38	E9	30	8D	22	C2	AA	20	2F
C3A8:C2	Cl	4C	60	C3	A2	1D	4C	CØ
C3BØ: ØE	C3	A2	17	4C	ØE	C3	A2	BA
C3B8:1C	4C	ØE	C3	A2	15	4C	ØE	6F
C3C0:C3	4C	42	C6	AC	22	C2	18	7D
C3C8:B9	F8	07	69	01	99	F8	07	4A
C3DØ:4C	60	C3	AC	22	C2	38	B9	20
C3D8:F8	07	E9	01	99	F8	07	4C	F6
	C3	20	51	C4	20	24	C2	54
C3E0:60	CS		DI	C4				The Control
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				T-100				
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C3F0:F0 C3F8:F0 C400:C9 C408:33	ØD Ø1 C3	4C FØ DE	ØE 11 Ø1	C4 4C DØ	AD 33 60	8D C4 20	Ø2 2Ø 33	AØ B6 83
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C3F0:F0 C3F8:F0 C400:C9 C408:33 C410:C3 C418:BD C420:00 C428:10 C430:00 C438:D0 C440:60 C440:60 C440:60	ØD Ø1 C3 FE ØØ DØ DØ C9 AD 1Ø A5 FØ	4C FØ DE Ø1 DØ 6Ø 8D 6Ø FF 23 DØ C5	ØE 11 01 DØ C9 AD 10 20 FØ C2 A9 C9	C4 4C 00 60 00 23 D0 33 04 18 00 2E 2D	AD 33 60 20 F0 C2 A9 C3 FE 6D 9D F0 F0	8D C4 20 33 04 38 FF BD 00 10 00 24	02 20 33 C3 DE ED 9D 00 D0 C9 C9 8D	AØ B6 83 16 E1 47 6B 2Ø 98 5D 98 1Ø FE 27
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C3FØ:FØ C3F8:FØ C400:C9 C408:33 C410:C3 C418:BD C420:00 C428:10 C430:00 C438:DØ C440:60 C448:BD C450:60 C448:BD C450:60 C458:37 C460:32 C468:15 C470:AD C478:4C C480:C5 C488:FØ C480:EE C490:E	0D13FE0000D09D09AD05FE0534C5533C5440G5EE	4C FØ DE 1 0 0 0 8 0 0 0 5 5 2 3 A D 0 2 2 A C 5 C C 4 C 5 C 4 C 5 C 4 C 5 C 4 C 5 C 4 C 5 C 4 C 5 C 6 C 6 C 6 C 6 C 6 C 6 C 6 C 6 C 6	0E 11 01 09 10 20 60 60 20 60 20 20 20 20 20 20 20 20 20 20 20 20 20	C4 4C D0 60 023 04 18 02E 2D D0 01 42 C5 55 55 55 55 55 56 57 40 40 40 40 40 40 40 40 40 40	AD 33 60 0 20 0 20 5 20 5 20 5 20 5 20 5 20 5	8D C 4 4 2 3 3 4 8 F F B D Ø Ø 2 4 4 6 D Ø 6 4 9 D 1 3 Ø 9 P 7 C C 4 4 C Ø Ø D 1 3 Ø 9 P 7 C C 4 C Ø 1 4 C Ø Ø D 1 3 Ø 9 P 7 C C 4 C Ø 1 4 C Ø Ø D 1 3 Ø 9 P 7 C C 4 C Ø 1 C Ø D 1 3 Ø 9 P 7 C C 4 C Ø D 1 3 Ø 9 P 7 C C 6 C Ø D 1 3 Ø 9 P 7 C C 6 C Ø D 1 3 Ø 9 P 7 C C 6 C Ø D 1 3 Ø 9 P 7 C C 6 C Ø D 1 3 Ø 9 P 7 C C 6 C Ø D 1 3 Ø 9 P 7 C C 6 C Ø D 1 3 Ø 9 P 7 C C 6 C Ø D 1 3 Ø 9 P 7 C C 6 C Ø D 1 3 Ø 9 P 7 C C 6 C Ø D 1 3 Ø 9 P 7 C C C 6 C Ø D 1 3 Ø 9 P 7 C C C 6 C Ø D 1 3 Ø 9 P 7 C C C 6 C Ø D 1 3 Ø 9 P 7 C C C 6 C Ø D 1 3 Ø 9 P 7 C C C 6 C Ø D 1 3 Ø 9 P 7 C C C 6 C Ø D 1 3 Ø 9 P 7 C C C 6 C Ø D 1 3 Ø 9 P 7 C C C C 6 C C C C C C C C C C C C C C	02 02 03 03 03 05 05 05 05 05 05 05 05 05 05 05 05 05	AØ B6 83 16 1 46 B 9 8 9 8 9 8 9 8 9 7 8 9 10 10 10 10 10 10 10 10 10 10 10 10 10
C3FØ:FØ C3F8:FØ C400:C9 C400:C9 C400:C3 C410:C3 C418:BD C420:00 C428:10 C430:00 C438:D0 C440:60 C448:8D C450:60 C458:37 C460:32 C460:32 C470:50 C470:C5 C480:C5 C480:C5 C480:C5 C480:FØ C400:TC C400:C5 C400:C	0D13E00000000000000000000000000000000000	4C FØ DE 1 0 1 0 6 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0	0E 1110109 AD 1009 E009 E009 E009 E009 E009 E009 E009	C4 4C D0 60 00 23 04 18 00 2E 2D 01 64 20 C5 15 C5 15 C5 15 C2 27	AD 33 60 20 F0 20 F0 20 F0 20 F0 8D F0 8D 20 F0 8D 20 F0 8D 8D 20 F0 8D	8D C 4 4 2 3 3 4 8 F F B D Ø Ø 2 4 4 6 0 Ø 1 6 C C C 4 4 9 9 1 3 2 9 9 2 7 4 C	02 20 33 33 C3E 9D 00 00 00 00 00 00 00 00 00 00 00 00 00	AØ B6 83 16 E17 46B 20 98 10 E27 62 B3 79 DC BF C5 22 BF C6 F C5 60
C3FØ:FØ C3F8:FØ C400:C9 C408:33 C410:C3 C418:BD C420:00 C428:10 C430:00 C438:DØ C440:60 C448:BD C450:60 C458:37 C460:32 C468:15 C470:AD C478:4C C480:C5 C488:16 C490:EE C490:EE C490:EC C480:FØ C488:TO C480:FØ C488:TO C480:EC EC EC EC EC EC EC EC EC EC EC EC EC E	0D13E000D09D09D0A105E0534C553554E006E00	4C F0 DE 0 0 0 0 60 8D 0 60 8D 0 C5 9 2A D 0 C2 2D 4C 5 4C C4C 5 4C C5 4C 6 F 1 E 2 C AC 1 25 4C	0E 11 01 0C9 AD 10 20 60 12 20 60 20 20 20 20 20 20 20 20 20 20 20 20 20	C4 4C D0 60 023 048 10 22 D0 164 20 55 55 55 51 53 51 52 52 54 54 54 54 54 54 54 54 54 54 54 54 54	AD 33 60 0 20 0 20 0 20 0 20 0 20 0 20 0 2	8D C 4 0 3 3 4 4 6 6 9 6 4 9 0 9 9 1 3 2 9 9 7 C C 2 1	020333CDEDDD0099DD0CC8CC1EC40D4FBC199CC6ED0	AØ B66 836 161 47 68 98 D8 98 D8 16 E 27 26 B3 99 D7 DC BF 53 25 D6 67 F5 60 00 4C
C3FØ:FØ C3F8:FØ C400:C9 C408:33 C410:C3 C418:BD C420:00 C428:10 C438:DØ C438:DØ C448:8D C450:60 C448:8D C450:60 C458:37 C460:32 C468:15 C470:AD C478:4C C480:C5 C480:EC C498:FØ C408:T C	0D13E00000000000000000000000000000000000	4C F0 DE 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0E 1101009 AD 10020 F02A9 C09601 20020 AD 2D 2D 2D 2D 2D 2D 20020 20020	C4 4CD0060023 0033 004 10064 2005 1055 1055 1055 1055 1055 1055 1055	AD 333600 200 200 200 200 200 200 200 200 200	8D C 4 4 3 3 4 4 6 6 7 9 6 4 4 6 6 9 0 9 9 2 7 4 C 4 2 1 8 A	02 03 33 C DE D D D 09 9 D C C 16 E C 40 D C C C C C C C C D C C C D A 6	AØ B63 1617 6B 98 D 8 9 8 D 8 7 D C 20 C 3 B C 20 C A E A E C 20 C
C3FØ:FØ C3F8:FØ C400:C9 C408:33 C410:C3 C418:BD C420:00 C428:10 C430:00 C438:DØ C440:60 C448:BD C450:60 C458:37 C460:32 C468:15 C470:AD C478:4C C480:C5 C488:16 C490:EE C490:EE C490:EC C480:FØ C488:TO C480:FØ C488:TO C480:EC EC EC EC EC EC EC EC EC EC EC EC EC E	0D13E000D09D09D0A105E0534C553554E006E00	4C F0 DE 0 0 0 0 60 8D 0 60 8D 0 C5 9 2A D 0 C2 2D 4C 5 4C C4C 5 4C C5 4C 6 F 1 E 2 C AC 1 25 4C	0E 11 01 0C9 AD 10 20 60 12 20 60 20 20 20 20 20 20 20 20 20 20 20 20 20	C4 4C D0 60 023 048 10 22 D0 164 20 55 55 55 51 53 51 52 52 54 54 54 54 54 54 54 54 54 54 54 54 54	AD 33 60 0 20 0 20 0 20 0 20 0 20 0 20 0 2	8D C 4 0 3 3 4 4 6 6 9 6 4 9 0 9 9 1 3 2 9 9 7 C C 2 1	020333CDEDDD0099DD0CC8CC1EC40D4FBC199CC6ED0	AØ B66 836 161 47 68 98 D8 98 D8 16 E 27 26 B3 99 D7 DC BF 53 25 D6 67 F5 60 00 4C
C3FØ:FØ C3F8:FØ C400:C9 C408:33 C410:C3 C418:BD C420:00 C428:10 C430:00 C438:D0 C448:8D C450:60 C448:8D C450:60 C448:8D C450:60 C448:8D C450:60 C448:8D C450:60 C448:15 C470:AD C478:4C C480:C5 C480:C	0D13E00000000000000000000000000000000000	4C FØ BD B B B B B B B B B B B B B B B B B B	0E 1110109 AD 1009 E009 6019 2005 200 200 200 200 200 200 200 200 20	C4 4CD0060023 0418002E 2DD0164 2055 155CC5 3312 274C 4CB00	AD33600 200 200 200 200 200 200 200 200 200	8D C 4 4 3 3 4 4 6 6 7 8 9 8 9 9 9 1 2 9 9 9 1 2 9 9 2 7 C C 4 4 8 9 D 1 8 D 1 8 D 1 8 D 1 8 D 1 8 D 1 8 D 1 8 D 1 8 D 1 8 D 1 8 D 1 8 D 1 8 D	020333CJE9D000999D5556EE400D4FBD199COEE0A699	AØ B6 83 16 1 47 68 89 80 80 80 80 80 80 80 80 80 80 80 80 80
C3FØ:FØ C3F8:FØ C400:C9 C408:33 C410:C3 C418:BD C420:00 C428:10 C438:DØ C438:DØ C448:8D C450:60 C448:8D C450:60 C458:37 C460:32 C468:15 C470:AD C478:4C C480:C5 C480:EC C498:FØ C408:T C	0D13E00000000000000000000000000000000000	4C F0 DE 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0E 1101009 AD 10020 F02A9 C09601 20020 AD 2D 2D 2D 2D 2D 2D 20020 20020	C4 4CD0060023 0033 004 10064 2005 1055 1055 1055 1055 1055 1055 1055	AD 333600 200 200 200 200 200 200 200 200 200	8D C 4 4 3 3 4 4 6 6 7 9 6 4 4 6 6 9 0 9 9 2 7 4 C 4 2 1 8 A	02 03 33 C DE D D D 09 9 D C C 16 E C 40 D C C C C C C C C D C C C D A 6	AØ B63 1617 6B 98 D 8 9 8 D 8 7 D C 20 C 3 B C 20 C A E A E C 20 C

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C510:28 C0 D0 EF 60 00 00 00 FB
C518:00 00 00 20 9B B7 8E 15 93
C520:C5 20 9B B7 8E 16 C5 20 FD
C528:9B B7 8E 17 C5 AD 16 C5 89
C530:CD 11 C0 B0 12 A9 01 8D D0
C538:18 C5 AD 11 CØ 38 ED 16 EØ
C540:C5 8D 1A C5 4C 56 C5 A9 A2
C548:00 8D 18 C5 AD 16 C5 38 20
C550:ED 11 C0 8D 1A C5 A2 00 35
C558:AØ ØØ AD 18 C5 C9 Ø1 FØ B3
C560:0D BD 11 C0 18 6D
                       1A C5 80
C568:9D 11 CØ 4C 78 C5 BD 11 4B
C570:C0 38 ED 1A C5 9D 11 C0 51
C578:C8 E8 E8 CC 28 CØ DØ DA 4D
C580:AD 10 D0 29 01 CD 17 C5 C6
C588:FØ 3E 9Ø 1E A9 Ø1 8D 18 94
C590:C5 A9 FF 38 ED 15 C5 8D C9
C598:19 C5 AD 10 C0 18 6D 19 33
C5A0:C5 8D 19 C5 EE 19 C5 4C A5
C5A8:F1 C5 A9 00 8D 18 C5 A9 D5
C5BØ:FF 38 ED 10 CØ 8D 19 C5 3D
C5B8:AD 15 C5 18 6D 19 C5 8D 83
C5C0:19 C5 EE 19 C5 4C F1 C5 C2
C5C8:AD 15 C5 CD 10 C0 B0 12 FC
C5DØ: A9 Ø1 8D 18 C5 AD 10 CØ 6A
C5D8:38 ED 15 C5 8D 19 C5 4C A3
C5EØ:F1 C5 A9 ØØ 8D 18 C5 AD 12
C5E8:15 C5 38 ED 10 C0 8D 19 0E
C5FØ:C5 AØ ØØ A2 ØØ AD 18 C5 5E
C5F8:C9 01
           FØ 1F 18 BD 10 CØ 52
C600:6D 19 C5 9D 10 C0 A9 00 F3
C608:69 00 C9 00 F0 29 B9 1A 3D
C610:C2 18 6D
              20 C0 8D 20 C0 F1
C618:4C 37 C6 38 BD 10 C0 ED 93
C620:19 C5 9D 10 C0 A9 00 E9 F6
C628:00 C9 00 F0 0A AD 20 C0
                             3F
C630:38 F9 1A C2 8D 20 C0 E8 1F
C638:E8 C8 CC 28 CØ DØ B6 4C 8B
C640:C0 C2 20 FE C1 20 E4 FF 2B
C648:C9 44 FØ Ø9 C9 41 FØ Ø3 B2
C650:4C 45 C6 60 0B 20 03 C0 D3
C658:20 0C C2 A9 00 8D 54 C6 91
C660: A9 AØ AC 54 C6 99 ØA Ø4 7A
C668:20 E4 FF C9 00 F0 F1 C9 4D
           2F C9 ØD FØ
                       48 C9 4D
C670:14 FØ
C678:20 FØ ØE C9 2F BØ Ø3 4C 3F
C680:60 C6 C9 5B 90 03 4C 60 68
C688:C6 AE 54 C6 EØ 1Ø 9Ø Ø3 87
C690:4C 60 C6 AC 54 C6 99 50 41
C698:CØ 2Ø D2 FF EE 54 C6 4C 8B
C6A0:60 C6 AD 54 C6 C9 00 D0 39
C6A8:03 4C 60 C6 A9 20 AC 54 BE
C6B0:C6 99 ØA Ø4 CE 54 C6 A9 88
C6B8:14 20 D2 FF 4C 60 C6 A9 CD
C6C0:20 AC 54 C6 99 0A 04 A9 27
C6C8:00 8D 15 D0 A9 11 20 D2 0E
           54 C6 AØ CØ A2 5Ø 5E
C6DØ:FF AD
C6D8: 20 BD FF A9 00 A2 08 A0 BB
C6E0:01 20 BA FF A0 C0 A2 00 9B
C6E8:86 FA 84 FB
                 AØ C6 A2 FF 2E
C6FØ: A9 FA 2Ø D8 FF 4C Ø6 CØ A1
C6F8:C7 A2 ØF A9 FA 20 D8 00 99
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POWER DEMO

PK 5 REM COPYRIGHT 1993 - COMP UTE PUBLICATIONS INTL LTD - ALL RIGHTS RESERVED AE 10 REM POWERSPRITE DEMO EB 20 IFPEEK(49152) <>76THENLOA

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D"POWERSPRITE",8,1
FA 30 POKE53280,11:POKE53281,6
PB 40 PRINT"{CLR}"CHR$(14):POK
E53269,0
```

MS 50 PRINT"{DOWN}{WHT}
{6 SPACES}{RVS} POWERSPR
ITE{2 SPACES}DEMONSTRATI
ON"

SC 60 PRINT"{2 DOWN}{CYN} POSI TIONING, MOVING AND ANIM ATING{6 SPACES}"

CR 70 PRINT" MULTIPLE SPRITES {SPACE}IS NOW A SNAP. {2 SPACES}THIS{2 SPACES}

DA 80 PRINT" UTILITY CONNECTS {SPACE}UP TO EIGHT SPRIT ES TO"

CJ 90 PRINT" CREATE A GIANT 'P OWERSPRITE', THAT CAN "

ES 100 PRINT" BE MOVED OR ANIM ATED WITH ONE COMMAND. {SPACE}"

HM 110 PRINT" POWERSPRITE IS A
CCESSED USING SIMPLE
{3 SPACES}"

AJ 120 PRINT" SYS COMMANDS FRO M DIRECT MODE, OR YOUR {SPACE}"

JR 130 PRINT" OWN BASIC OR MAC HINE LANGUAGE PROGRAMS.

EH 140 PRINT" (DOWN) (YEL)

{7 SPACES} - HIT A KEY T

O CONTINUE -"

PJ 150 GET K\$:IFK\$=""THEN150 ER 160 PRINT"{CLR}{3 DOWN}

{CYN} POWERSPRITE CAN B
E USED TO STORE DATA
{2 SPACES}"

HX 170 PRINT" FOR ALL SPRITES, INCLUDING ALL X AND Y {5 SPACES}"

PK 180 PRINT" VALUES, COLORS, {SPACE}FRAMES, AND EXPA NSION. "

HK 190 PRINT" A SIMPLE EDITOR {SPACE}ALLOWS SPRITE SE TUP{4 SPACES}"

GG 200 PRINT" WITHOUT TEDIOUS {SPACE}PEEKS AND POKES. {2 SPACES}DATA "

QJ 210 PRINT" CAN BE STORED ON DISK FOR USE IN YOUR {2 SPACES}"

FX 220 PRINT" OWN PROGRAMS.
{2 SPACES}DATA IS RECAL
LED WITH {3 SPACES}"

AF 230 PRINT" ONE SIMPLE COMMA ND.{2 SPACES}PLEASE HIT A KEY{2 SPACES}"

JX 240 PRINT" TO SEE A POWERSP RITE IN ACTION... {6 SPACES}"

EA 250 GET K\$:IFK\$=""THEN250 RE 260 REM ** POWERSPRITE DEMO AF 270 PRINT" {CLR}": POKE 53281,

AP	2/0	
70	200	O DELIMBIR (DOMA) (GAM) MAD DE
JQ	280	PRINT" { DOWN } {CYN } THE BI
		G BLOCK IS A POWERSPRIT
		E USING{4 SPACES}"
MG		PRINT"ALL EIGHT SPRITES
		CONNECTED. {2 SPACES}A
		{SPACE}SINGLE{2 SPACES}
12	79 11	SC 68 PRINT" [2 DOWN & LOT's
GE	300	PRINT"COMMAND WILL MOVE
		OR ANIMATE THIS GIANT
		{SPACE}"
RB	310	PRINT"SPRITE. {2 SPACES}
		NOTE: POWERSPRITE IS NO
		T A [5 SPACES]"
FF	320	PRINT"SPRITE EDITOR.
		{2 SPACES}ANY SPRITE ED
		ITOR, SUCH "
QX	330	PRINT"AS SPRITE MAGIC W
		ILL CREATE GRAPHICS
		{4 SPACES}"
EB	349	PRINT"COMPATIBLE WITH P
		OWERSPRITE.
AC	350	PRINT" {2 DOWN } {YEL}
		{4 SPACES} - HIT A KEY &
		WAIT TO CONTINUE -"
во	360	
	100	KEX, 255: NEXT
PS	370	SYS 49158: REM ** DISPL
	5,0	AY/RECALL SPRITES
хн	380	
****	500	** SET START X AND Y C
		OORDINATES FOR POWERSPR
		ITE
XC	390	FOR X=50 TO 200 STEP 2
EA	400	SYS49164, X, 200, 0: NEXT
		SYS49164, X, 200, 0: NEXT FOR Y=200 TO 100 STEP -
EA	400	SYS49164, X, 200, 0:NEXT FOR Y=200 TO 100 STEP -
EA MD AE	400 410 420	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT
EA MD AE CA	400 410 420 430	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2
EA MD AE CA FC	400 410 420 430 440	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT
EA MD AE CA FC XR	400 410 420 430 440 450	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200
EA MD AE CA FC XR SH	400 410 420 430 440 450 460	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT
EA MD AE CA FC XR SH PB	400 410 420 430 440 450 460 470	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP - 2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390
EA MD AE CA FC XR SH	400 410 420 430 440 450 460	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP - 2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6
EA MD AE CA FC XR SH PB CS	400 410 420 430 440 450 460 470 480	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP -1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0
EA MD AE CA FC XR SH PB CS	400 410 420 430 440 450 460 470	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP -1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR}{DOWN}{WHT}
EA MD AE CA FC XR SH PB CS	400 410 420 430 440 450 460 470 480	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR}{DOWN}{WHT} {9 SPACES}{RVS} POWERSP
EA MD AE CA FC XR SH PB CS	400 410 420 430 440 450 460 470 480 490	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR}{DOWN}{WHT} {9 SPACES}{RVS} POWERSP RITE{2 SPACES}COMMANDS"
EA MD AE CA FC XR SH PB CS	400 410 420 430 440 450 460 470 480 490	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP - 2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR}{DOWN}{WHT} 9 SPACES}{RVS} POWERSP RITE{2 SPACES}COMMANDS" PRINT"{2 DOWN}TYEL}ALL
EA MD AE CA FC XR SH PB CS	400 410 420 430 440 450 460 470 480 490	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP -1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR} {DOWN} {WHT} {9 SPACES} {RVS} POWERSP RITE{2 SPACES} COMMANDS" PRINT"{2 DOWN} YEL}ALL {SPACE} ACCESSABLE THRU
EA MD AE CA FC XR SH PB CS	400 410 420 430 440 450 460 470 480 490	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP -1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"(CLR) {DOWN} {WHT} {9 SPACES} {RVS} POWERSP RITE{2 SPACES} COMMANDS" PRINT"(2 DOWN) {YEL}ALL {SPACE} ACCESSABLE THRU {SPACE}BASIC OR DIRECT
EA MD AE CA FC XR SH PB CS JQ FB	400 410 420 430 440 450 460 470 480 490	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP -1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR} {DOWN} {WHT} {9 SPACES} {RVS} POWERSP RITE{2 SPACES} COMMANDS" PRINT"{2 DOWN} TYEL}ALL {SPACE} ACCESSABLE THRU {SPACE} BASIC OR DIRECT {SPACE} MODE"
EA MD AE CA FC XR SH PB CS JQ FB	400 410 420 430 440 450 460 470 480 490	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR}{DOWN}{WHT} {9 SPACES}{RVS} POWERSP RITE{2 SPACES}COMMANDS" PRINT"{2 DOWN}TYEL}ALL {SPACE}ACCESSABLE THRU {SPACE}BASIC OR DIRECT {SPACE}MODE" PRINT"{2 DOWN}{WHT} SYS
EA MD AE CA FC XR SH PB CS JQ FB	400 410 420 430 440 450 460 470 480 490 500	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"(CLR) {DOWN} {WHT} {9 SPACES} {RVS} POWERSP RITE{2 SPACES} COMMANDS" PRINT"(2 DOWN) {YEL}ALL {SPACE} ACCESSABLE THRU {SPACE} BASIC OR DIRECT {SPACE} MODE" PRINT"(2 DOWN) {WHT} SYS 49152 {CYN} ENTER POW
EA MD AE CA FC XR SH PB CS JQ FB	400 410 420 430 440 450 470 480 490 500	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR}{DOWN}{WHT} {9 SPACES}{RVS} POWERSP RITE{2 SPACES}COMMANDS" PRINT"{2 DOWN}TYEL}ALL {SPACE}ACCESSABLE THRU {SPACE}ACCESSABLE THRU {SPACE}ACCESSABLE THRU {SPACE}ACCESSABLE THRU {SPACE}ACCESSABLE THRU {SPACE}ACCESSABLE THRU {SPACE}MODE" PRINT"{2 DOWN}{WHT} SYS 49152 {CYN}- ENTER POW ERSPRITE EDITOR
EA MD AE CA FC XR SH PB CS JQ FB	400 410 420 430 440 450 470 480 490 500	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP - 2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR}{DOWN}{WHT} {9 SPACES}{RVS} POWERSP RITE{2 SPACES}COMMANDS" PRINT"{2 DOWN}TYEL}ALL {SPACE}ACCESSABLE THRU {SPACE}BASIC OR DIRECT {SPACE}MODE" PRINT"{2 DOWN}{WHT} SYS 49152 {CYN} - ENTER POW ERSPRITE EDITOR PRINT"{DOWN}{WHT} SYS 4
EA MD AE CA FC XR SH PB CS JQ FB	400 410 420 430 440 450 460 470 480 490 500	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP - 2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR}{DOWN}{WHT} {9 SPACES}{RVS} POWERSP RITE{2 SPACES}COMMANDS" PRINT"{2 DOWN}{YEL}ALL {SPACE}ACCESSABLE THRU {SPACE}BASIC OR DIRECT {SPACE}MODE" PRINT"{2 DOWN}{WHT} SYS 49152 {CYN} - ENTER POW ERSPRITE EDITOR PRINT"{DOWN}{WHT} SYS 4 9155 {CYN} - STORE SPRIT
EA MD AE CA FC XR SH PB CS JQ FB AQ BB	400 410 420 430 440 450 460 470 480 490 500	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP -1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR} {DOWN} {WHT} {9 SPACES} {RVS} POWERSP RITE{2 SPACES} COMMANDS" PRINT"{2 DOWN} YEL}ALL {SPACE}ACCESSABLE THRU {SPACE}BASIC OR DIRECT {SPACE}MODE" PRINT"{2 DOWN} {WHT} SYS 49152 {CYN} = ENTER POW RSPRITE EDITOR PRINT"{DOWN} {WHT} SYS 49155 {CYN} - STORE SPRITE E INFO MANUALLY"
EA MD AE CA FC XR SH PB CS JQ FB AQ BB	400 410 420 430 440 450 460 470 480 490 500	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP - 2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR}{DOWN}{WHT} {9 SPACES}{RVS} POWERSP RITE{2 SPACES}COMMANDS" PRINT"{2 DOWN}{YEL}ALL {SPACE}ACCESSABLE THRU {SPACE}BASIC OR DIRECT {SPACE}MODE" PRINT"{2 DOWN}{WHT} SYS 49152 {CYN} - ENTER POW ERSPRITE EDITOR PRINT"{DOWN}{WHT} SYS 4 9155 {CYN} - STORE SPRIT
EA MD AE CA FC XR SH PB CS JQ FB AQ BB	400 410 420 430 440 450 470 480 490 500 510 520	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"(CLR) [DOWN) {WHT} {9 SPACES} {RVS} POWERSP RITE{2 SPACES} COMMANDS" PRINT"(2 DOWN) {YEL}ALL {SPACE} ACCESSABLE THRU {SPACE} BASIC OR DIRECT {SPACE} MODE" PRINT"(2 DOWN) {WHT} SYS 49152 {CYN} - ENTER POW ERSPRITE EDITOR PRINT"(DOWN) {WHT} SYS 49155 {CYN} - STORE SPRIT E INFO MANUALLY" PRINT" {DOWN} {WHT} SYS 4 9158 {CYN} - DISPLAY/REC
EA MD AE CA FC XR SH PB CS JQ FB AQ BB	400 410 420 430 440 450 470 480 490 500 510 520	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"(CLR) [DOWN) {WHT} {9 SPACES} {RVS} POWERSP RITE{2 SPACES} COMMANDS" PRINT"{2 DOWN} {YEL}ALL {SPACE} ACCESSABLE THRU {SPACE} BASIC OR DIRECT {SPACE} MODE" PRINT"{2 DOWN} {WHT} SYS 49152 {CYN} - ENTER POW ERSPRITE EDITOR PRINT"(DOWN) {WHT} SYS 49155 {CYN} - STORE SPRIT E INFO MANUALLY" PRINT"{DOWN} {WHT} SYS 4 9158 {CYN} - DISPLAY/REC ALL SPRITES"
EA MD AE CA FC XR SH PB CS JQ FB AQ BB MR	400 410 420 430 440 450 470 480 490 500 510 520	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR}{DOWN}{WHT} {9 SPACES}{RVS} POWERSP RITE{2 SPACES}COMMANDS" PRINT"{2 DOWN}{YEL}ALL {SPACE}ACCESSABLE THRU {SPACE}BASIC OR DIRECT {SPACE}MODE" PRINT"{2 DOWN}{WHT} SYS 49152 {CYN}-ENTER POW ERSPRITE EDITOR PRINT"{DOWN}{WHT} SYS 49155 {CYN}-STORE SPRIT E INFO MANUALLY" PRINT"{DOWN}{WHT} SYS 4 9158 {CYN}-DISPLAY/REC ALL SPRITES"
EA MD AE CA FC XR SH PB CS JQ FB AQ BB MR	400 410 420 430 440 450 470 480 490 500 510 520 530	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP - 2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR}{DOWN}{WHT} {9 SPACES}{RVS} POWERSP RITE{2 SPACES}COMMANDS" PRINT"{2 DOWN}{YEL}ALL {SPACE}ACCESSABLE THRU {SPACE}ACCESSABLE THRU {SPACE}BASIC OR DIRECT {SPACE}MODE" PRINT"{2 DOWN}{WHT} SYS 49152 {CYN} - ENTER POW ERSPRITE EDITOR PRINT"{DOWN}{WHT} SYS 49155 {CYN} - STORE SPRIT E INFO MANUALLY" PRINT"{DOWN}{WHT} SYS 49158 {CYN} - DISPLAY/REC ALL SPRITES" PRINT"{DOWN}{WHT} SYS 49161,F{CYN} - ANIMATES
EA MD AE CA FC XR SH PB CS JQ FB AQ BB MR	400 410 420 430 440 450 470 480 490 500 510 520 530	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP - 2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR}{DOWN}{WHT} {9 SPACES}{RVS} POWERSP RITE{2 SPACES}COMMANDS" PRINT"{2 DOWN}{YEL}ALL {SPACE}ACCESSABLE THRU {SPACE}ACCESSABLE THRU {SPACE}BASIC OR DIRECT {SPACE}MODE" PRINT"{2 DOWN}{WHT} SYS 49152 {CYN} - ENTER POW ERSPRITE EDITOR PRINT"{DOWN}{WHT} SYS 49155 {CYN} - STORE SPRIT E INFO MANUALLY" PRINT"{DOWN}{WHT} SYS 49158 {CYN} - DISPLAY/REC ALL SPRITES" PRINT"{DOWN}{WHT} SYS 49161,F{CYN} - ANIMATES
EA MD AE CA SH PB CS JQ BB MR	400 410 420 440 440 450 480 490 500 510 520 530	SYS49164,X,200,0:NEXT FOR Y=200 TO 100 STEP - 1 SYS49164,200,Y,0:NEXT FOR X=200 TO 50 STEP -2 SYS49164,X,100,0:NEXT FOR Y=100 TO 200 SYS49164,50,Y,0:NEXT IF PEEK(198)=0THEN 390 POKE53269,0:POKE53281,6 :POKE198,0 PRINT"{CLR}{DOWN}{WHT} {9 SPACES}{RVS} POWERSP RITE{2 SPACES}COMMANDS" PRINT"{2 DOWN}{YEL}ALL {SPACE}ACCESSABLE THRU {SPACE}ACCESSABLE THRU {SPACE}ACCESSABLE THRU {SPACE}MODE" PRINT"{2 DOWN}{WHT} SYS 49152 {CYN}- ENTER POW ERSPRITE EDITOR PRINT"{DOWN}{WHT} SYS 4 9155 {CYN}- STORE SPRIT E INFO MANUALLY" PRINT"{DOWN}{WHT} SYS 4 9158 {CYN}- DISPLAY/REC ALL SPRITES" PRINT"{DOWN}{WHT} SYS 4

A POWERSPRITE"

HF 560 PRINT"{2 DOWN}{YEL}

{3 SPACES}PLEASE SEE AR

TICLE FOR A DETAILED

{4 SPACES}"

BA 570 PRINT" (6 SPACES) EXPLANA TION OF EACH COMMAND." MF 580 GET K\$: IF K\$=""THEN580

Danny English, the author of Tunnel Trap (November 1992), lives in Moreno

MATCH-A-THON

By Troy McBain

JK 590 GOTO30

Valley, California.

Match-A-Thon is an amusing game for the 64 that tests your memory in the style of "Concentration," the old television game show. Match-A-Thon can be played by one or two players using one or two joysticks. The object is to match 15 pairs of shapes hidden behind 30 squares on a 5×6 playing grid. The player who matches the most shapes wins.

When only one person is playing, the game keeps track of the number of guesses it takes to clear the board. Single players can try to better their scores by matching all 15 shapes in a fewer number of attempts.

Entering the Game

Match-A-Thon is written entirely in machine language. To enter it, use MLX, our machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts, enter the following starting and ending addresses.

Starting address: 8000 Ending address: 8D27

Be sure to save a copy of the program before exiting MLX.

Playing the Game

Load Match-A-Thon with the ,8,1 extension and then type SYS 32768 to start the game. You'll be asked whether this is a one-player or two-player game using one or two joysticks. Make selections by moving the cursor with a joystick in port 1 and pressing the fire button. Then move the cursor to the Start Game option to begin play.

When the grid appears, move the cur- 8168:75 82 AD 66 88 C9 Ø5 DØ 29 sor to one of the squares and press 8170:03 4C 3D 81 EE 66 88 AD 97

the fire button. One of 15 shapes will appear. Move to another square and press the fire button again to reveal another shape. If the two shapes match, you'll hear a tone, and those two squares will be removed from play. If they do not match, the shapes will disappear. As the game progresses and more shapes appear, try to remember their locations so you can make future matches.

This game is fun and addictive to play. It makes good use of the 64's SID chip to produce sounds as the players make selections. The graphics are very crisp since each shape is created with four programmable characters.

MATCH-A-THON

8000:A9 FF 8D 68 88 8D 69 88 E3 8008:A9 00 8D C7 88 8D C6 88 8010:8D C5 88 20 B0 83 A9 aa 43 8018:8D C8 88 8D CB 88 8D 20 B7 8020:D0 8D 21 D0 A0 00 8C B5 F1 8028:88 20 75 85 A9 00 99 B6 8030:88 99 BA 88 C8 C0 04 90 9D 8038:F3 A0 00 A9 00 99 C1 Ø2 E1 8040:A9 10 99 22 8D C8 C0 1E 8048:DØ F1 AØ ØØ 8C 3E Ø3 A9 8050:00 85 FB A9 1D 85 FC 20 E.5 8058:2A 82 A6 FD BD C1 02 C9 8060:00 DØ EC C8 98 9D C1 02 80 8068:88 EE 3E 03 AD 3E 03 C9 97 8070:02 DØ DC C8 A9 00 8D 3E 8078:03 CØ ØF DØ D2 AØ ØØ B9 8080:0A 87 C9 00 F0 07 20 D2 58 8088:FF C8 4C 7F 8Ø A2 ØØ A9 8090:00 8D 3E 03 8D FF 03 A0 FF 8098:00 B9 43 87 20 D2 FF C8 80A0:C0 07 D0 F5 E8 E0 06 D0 80A8:EE EE FF 03 AD FF 03 C9 80B0:02 FØ 19 A9 92 20 D2 FF 67 80B8: A2 00 A9 9E 20 D2 FF A9 80C0:DD 20 D2 FF A9 0D 20 D2 A7 80C8:FF 4C 97 80 EE 3E 03 AD 80D0:3E 03 C9 05 F0 18 A0 00 80D8:B9 4A 87 C9 00 F0 07 20 8ØEØ:D2 FF C8 4C D8 80 A2 00 80E8:8E FF 03 4C 97 80 A0 00 80F0:B9 64 87 C9 00 F0 07 20 80F8:D2 FF C8 4C F0 80 A0 00 0C 8100:B9 26 88 99 00 38 C8 C0 8108:2A FØ Ø3 4C ØØ 81 A9 ØØ DA 8110:99 00 38 C8 CØ 40 FØ 03 8118:4C ØE 81 A9 EØ 8D F8 Ø7 CS 8120:A9 ØD 8D 27 DØ A9 Ø1 8D 1C 8128:1D DØ A9 Ø1 8D 17 DØ A9 47 15 DØ 2Ø 4C 82 8130:01 8D 20 1E 8138:6A 8B 20 DD 8B 20 E8 8C 8140:C9 00 F0 F9 C9 08 F0 13 49 12 C9 Ø1 FØ 8148:C9 Ø4 FØ 11 B5 8150:C9 02 FØ 10 C9 10 FØ 0F 57 8158:4C 3D 81 4C 6A 81 4C 9E 56 8160:81 4C D2 81 4C FE 81 4C 8168:75 82 AD 66 88 C9 05 D0

9164, X, Y, M {CYN} - MOVES

85D8:FB 38 E9 28 85 FB A5 FC 8178:00 DØ 18 69 18 8D ØØ DØ 11 83A8:84 8C 4C 16 80 4C 3D 81 31 4C 9E 85 AG E9 A9 DØ 85 FC 95 85EØ:E9 ØØ 85 FC 8188 · AD 18 D8 69 00 8D 10 DØ 36 83BØ:A9 00 85 FB 91 A9 FB 38 22 85 FD 30 85 FE 85E8:00 A9 20 A5 FB 8188:A5 BØ 83B8:A9 aa 18 69 93 85 BØ A5 59 50 85 FB A5 FC E9 90 6A 20 8D ØF DC 85F0:E9 85 7F 83CØ:AD ØE DC 29 FE 8190:B1 69 99 85 B1 66 C4 88 6E 01 A2 aa 30 85F8:85 FC AC 9F 85 AD 85 4C 3D 81 AD 66 60 83C8:A5 91 29 FB 85 8198:20 66 4C A4 85 AØ 50 FR 91 FD C8 CØ F4 8600:C9 02 DØ 93 81AØ:88 C9 aa DØ 93 4C 30 81 AC 83DØ: AØ aa B1 EE 91 FB C4 88 4A DØ 38 E9 36 83D8:08 90 F7 E8 EØ ga Fa 10 9B 8608:00 A9 20 81A8:CE 66 88 AD aa DØ 85 47 8610:AD C4 88 09 02 FØ 10 A5 60 10 E9 69 83EØ: A5 FB 18 69 08 FB A5 00 DØ AD 81BØ:18 8D FB A5 FC 3D FC A5 FD 18 **B3** 8618:FB 18 69 28 85 aa 85 A5 83E8:FC 69 81B8:00 80 10 DØ Ba 38 F. 9 78 9E 85 A5 EF 8620:69 FC 4C aa 85 81CØ:03 85 BØ A5 B1 E9 00 85 D1 83FØ:69 98 85 FD A5 FE 69 aa 38 FC A5 85 4C C3 83F8:85 FE 4C Da 83 A5 01 09 D6 8628:FB 18 69 50 85 FB CF 66 85 20 66 81C8:B1 20 DC 99 01 8630:69 aa 85 FC 4C 9E 85 20 7A 8400:04 al AD ØF 5E 81DØ:3D 81 AD 67 88 C9 aa DØ 3B 85 C4 88 96 66 85 AD 8498:8D ØE DC AD CE 88 AD ac DI 8638:21 85 20 81D8:03 4C 3D 81 CE 67 88 AD 03 DØ 85 99 8640:C9 02 DØ 15 20 51 85 20 9F 01 08 8410:84 85 FB AD ØD 84 FC 81E0:01 D0 38 E 9 18 8D C5 88 FF 8648:51 85 20 DA 84 AD BØ FD A9 35 85 FE **B4** 38 E 9 78 85 BØ A5 71 8418:A9 08 85 81E8:A5 02 8D C5 27 865Ø:C9 FØ 95 A9 85 FF 00 B1 FB 91 FD 2D 91 81FØ:B1 E9 aa 85 B1 20 66 8420:A2 aa AØ 93 8658:88 60 C9 aa DØ 5B 20 64 67 CD 8428:C8 CØ 08 90 F7 E8 EØ 3C 31 85 4C 30 81 AD 81F8:20 66 A4 8660:86 40 85 EE C5 88 AD FD 18 69 as 85 E 9 8200:88 C9 04 DØ 03 4C 3D 81 8E 8430:F0 1F A5 FB 00 C9 Da 95 A9 CI 82Ø8:EE 67 88 A5 BØ 18 69 78 FA 8438:FB A5 FC 69 00 85 FC A5 94 8668:C5 88 92 08 85 FD A5 FE 6A 8670:8D C5 88 C9 99 DØ 14 20 EE aa 85 69 B1 DB 8440:FD 18 8210:85 BØ A5 B1 69 8678:01 87 AØ 99 B9 50 88 C9 E5 4C 69 18 80 91 97 8448:69 aa 85 FE AØ aa 24 68 8218:AD 91 DØ 18 C8 4C 21 20 D2 FF 18 69 8680:00 F0 97 8220:DØ 20 66 85 20 66 85 4C AC 8450:84 AD 18 DØ 29 FØ BD 60 8688:7C C5 88 C9 91 41 A9 50 DØ 60 20 DA 84 98 86 AD 8228:3D 81 A9 FF 8D aF D4 8458:ØC 8D 18 97 71 8690:DØ 14 20 91 87 AG aa B9 12 D4 8D 18 D4 E6 CS 8460:A9 aa 8D 3E 03 A5 BØ SD 8230:80 8D FØ 07 29 D2 65 07 8698:5B 88 C9 aa E.4 FB FØ 99 1A 8468:FB Ø3 A5 B1 8D FC Ø3 AØ 8238:FC AE 1B D4 D9 B1 18 FR 86AØ:FF C8 4C 97 86 60 20 al 39 8470:00 A5 B0 85 B2 A5 8240:90 F7 E4 FC 90 93 4C 5A 86A8:87 AØ aa B9 00 00 C9 aa DØ 60 A9 79 85 BØ E.4 8478:69 D4 85 B3 AD CC 88 91 9A 8248:82 86 FD CB C8 4C AB 91 B2 C8 26 86BØ:FØ F3 20 D2 FF A9 1D 8D aa D3 8480:B0 AD CD 88 AD 8250:A9 04 85 B1 86B8:86 20 BF 86 4C A4 85 EE 60 9E A9 90 88 91 8258:DØ A9 47 80 01 Da aa 8488:CC 88 91 RA AD CD 88 C9 02 DØ 46 86CØ:C7 88 AD C7 88 A9 aa 60 18 69 27 A8 AD CC B6 8260:8D 66 88 8D 67 849Ø:B2 98 C7 88 18 CE aa 8D A2 86C8:05 A9 DØ AC **B5** 88 B9 AC ØD 8498:88 91 BØ AD CD 88 91 B2 A1 10 8268:8D AD CD 14 86DØ: Ø3 AØ ØE 20 FØ FF AD C7 F5 88 20 88 91 BØ 8270:88 8D 27 DØ 60 AD 67 84AØ:C8 AD CC 86D8:88 ØA ØA ØA 18 6D C7 88 1D 37 88 18 6D D9 84A8:88 91 B2 EE 3E 03 AD 3E 8278: ØA ØA 18 6D 67 C7 88 65 88 18 60 84BØ: Ø3 C9 02 FØ ØD AD C2 88 2A 86EØ:18 6D C7 88 A8 8C 68 8280:67 88 18 6D 66 00 B9 50 88 20 D2 46 C3 88 85 Bl 4C AC 86E8:A8 A2 8288:FD 03 B9 Cl 02 C9 aa DØ A8 84B8:85 BØ AD 91 04 FØ 03 4C SEFA: FF C8 E.8 E.O 8290:03 4C 3D 81 99 22 8D 20 7A 84CØ:6F 84 AD FB 03 85 BO AD 55 aa aa 40 A4 E.S CB 88 CB 88 40 84C8:FC 03 85 B1 60 A9 4E 8D BØ 86F8:EB 86 60 20 AD 8298:AE 8A EE 8D CD 88 4C 39 8700:85 18 A2 02 AØ ØE 20 FØ BA BØ 8D C2 B8 10 82AØ:C9 92 FØ A5 84DØ:CC 88 A9 ØA 93 20 20 20 98 4D A9 87Ø8:FF 82A8:88 A5 B1 8D C3 88 AD FE 05 84D8:5D 84 AØ 00 A2 00 C8 CØ 2D 60 Ø3 8D B2 E8 EØ C8 90 F6 6E 8710:41 54 43 48 2D 41 2D 54 DE 88 FD 84E0:00 D0 FB 82BØ:03 8D R4 AD 8718:48 4F 4E ØD 98 20 20 20 5F aa 90 D4 BØ 82B8:C9 88 20 21 85 4C 3D 81 34 84E8:60 A2 aa A9 aa 2F A 3 A 3 A 3 A3 82CØ: A5 BØ CD C2 88 DØ ØD A5 F1 84FØ:E8 EØ 19 90 F8 60 20 E9 46 8720:A3 A3 A3 A 3 A3 ØD 9E BØ CØ A5 88 DØ 96 CE CB 23 84F8:84 A9 99 8D Ø2 D4 A9 91 3F 8728:A3 A3 A3 82C8:B1 CD C3 A9 ØØ 8D CB 21 95 9C 8730:CØ B2 CØ CØ B2 CØ CØ B2 3D 3D 81 8500:8D 03 D4 A5 ØØ 8D D4 8200:88 4C B2 CØ CØ B2 CØ CØ 4D A9 ØF 8D 34 8738:CØ Ca 03 8D CA 88 AD D3 85Ø8:A9 05 8D 06 D4 82D8:88 AD FD 8740:AE ØØ 92 9E DD 12 9F 43 A5 00 8D 04 D4 AD E4 ØD 55 A9 30 82EØ:B4 88 CD FE 93 FO 8510:18 D4 8748:20 20 92 9E DD ØD 9E AB **B7** 82E8:AØ 8D CC 88 A9 03 8D CD Ø6 8518:B3 88 8D ØØ D4 8D 91 D4 84 DB CØ CO DB CO CO 2F A9 41 85 51 8750:C0 Ca 82FØ:88 20 31 85 20 5D 84 AD ED 8520:60 A9 24 85 00 CØ DB CØ CØ DB CØ DC 19 88 4C F6 E8 8758: DB CØ B9 88 18 A8 8528:00 A9 8D B3 82F8:B5 88 ØA A8 BA 8760:CØ B3 ØD ØØ 92 9E DD an 36 A9 C8 B9 BA 70 853Ø:84 A9 07 85 00 41 85 CF 8300:69 01 99 BA 88 8768:9E AD CØ CØ Bl CØ CO B1 1 A 8308:88 69 00 99 BA 88 20 CC 4C 8538:00 A9 03 8D **B3** 88 4C F6 36 CØ CØ 61 49 85 83 8770:CØ CØ Bl CØ CØ B1 aa 41 8310:8C 20 DD RR 20 29 SC AD 46 8540:84 A9 24 85 8778:B1 CØ CØ 00 1F 54 55 FE C9 FØ 18 BD 00 AD C5 5E 8D B3 88 4C F6 8B 8318:B5 88 8548:00 A9 2D 8550:84 20 8780:52 4E 53 20 20 40 41 54 C5 8320:88 C9 00 DØ 11 20 aa aa F3 41 85 20 66 85 20 EB 85 74 8788:43 48 45 53 ØD ØØ 1C A3 6D 8328:AD 84 93 CD 85 03 DØ 93 41 8558:21 85 20 66 85 20 41 20 75 8330:4C 3C 4C E7 82 20 DC 08 85 AØ ØØ EA 8790:A3 A3 A3 A3 20 A3 A3 83 8560:20 66 85 4C 21 CØ 8798:A3 A3 A3 A3 ØD aa 99 FB 8338:8C 3D 81 20 CC 8C 20 C5 8568:A2 ØØ C8 aa DØ FB E8 ØE A3 4C 87AØ:50 4C 41 59 45 52 20 4F AB C9 AC 88 25 B9 8340:51 85 20 CD 84 8570:E0 28 90 F6 60 AØ 00 B6 3A Ø5 4C 27 00 99 aa 9C 50 8348:A9 Cl 02 99 22 8D BB 8578:BB 87 C9 00 FØ 07 20 D2 33 87A8:4E 45 8350:AC CA 88 99 C1 02 99 22 76 8580:FF C8 4C 77 85 A9 00 8D 1 F 87BØ:41 59 45 52 20 54 57 4F D4 00 93 20 9R 4D 88 C9 87B8:3A 95 41 AA 8358:8D EE C8 88 AD CB EE 8588:C4 88 20 CE 86 CE C5 88 80 88 A8 87CØ:54 43 48 2D 41 2D 54 48 56 8360:0E FØ 27 AD B5 ØA F6 8590:20 64 86 A9 50 85 FB A9 6A 01 05 20 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                                                                          54
8A20:F0
         EØ
            FE
                FF
                    FF
                       FF
                           3F
                                  63
                                       8050:01 60
                              1F
                                                           ØA
                                                               AØ
                                                                   aa
                                                                          22
                                                    18
                                                        A2
                                                                      20
8A28: OF 07 7F FF FF FF FF FF
                                  76
                                       8C58:FØ FF
                                                    AØ
                                                       00
                                                           B9
                                                               6A
                                                                  88
                                                                      C9
                                                                          50
8A30:FF FC FC FØ E8 E8 FF FF
                                       8C60:00 F0 07 20 D2 FF
                                                                  C8 4C
                                  1E
```

```
8C68:5C 8C AE
               68
                   88
                      AD 69
                             88
8C70:20 CD BD
               AØ
                   00
                      B9
                          A3
                             88
                                 85
8C78:C9
         aa
            FA
               07
                   20
                      D2
                         FF
                             C8
8C80:4C
         75
            8C
                60
                   AD
                      C5
                          88
                             C9
                                 14
8C88:02 DØ
            21
               AD
                   BB
                      88
                          CD
                             69
                                DA
8090:88 90
                      4C
            ØD FØ
                   03
                         AC
                             8C
8C98:AD
         BA
            88
               CD
                   68
                      88
                          BØ
                             ac
                                F7
8CA0: AD BA 88
               80
                   68
                                A5
                      88
                         AD
                             BB
8CA8:88 8D
            69
               88
                   18
                      A2
                         09
                             AØ
8CBØ: 04
         20
            FØ
               FF
                   AØ
                      00
                          B9
                             7D
                                E7
8CB8:88 C9
            00
               FØ
                   97
                      20 D2
                             FF
                                F5
8CCØ:C8 4C B6
               8C
                   20
                      E4
                         FF
8CC8:20 D0
            F9
               60
                   AD
                      C5
                          88 C9
                                CA
8CDØ:00 FØ 01
               60 AD B5
                         88 09
                                6B
8CD8:00 F0 01
               60
                  AD
                      15 DØ
                             29
8CEØ:FE
         18
            69
               91
                   8D
                      15 DØ
                             60
                                7 F
8CE8:AD
        C7
            88
               C9
                  aa Fa
                         10
                             AD
                                24
8CFØ:B5
        88 C9
               00
                  Fa
                      16 AD
                             00
8CF8:DC
         29
            1F
               8D
                   84
                      03
                         A9
                             1F
                                2A
8DØØ:38 ED 84 Ø3 8D
                     84
                         03
                             C9
                                Cl
8DØ8:00 FØ EB 60 AD 01 DC
                            29
                                37
8D10:1F
        80
            84 Ø3 A9
                     1F
                         38 ED
                                07
8D18:84 Ø3 8D 84 Ø3 C9
                         00
                            FØ
                                60
8D20:EB 60 00 00 00 00 00 00
```

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XINPUT

By Farid Ahmad

Xinput is a replacement for BASIC's IN-PUT command for the 64. It overcomes all the weaknesses of INPUT and offers many additional features.

Xinput can handle strings up to 255 characters in length. It supports all of the usual editing keys, including cursor up, down, left, and right and the Inst/Del key. In addition, Xinput offers tight control over the characters that a user might enter. Up to 25 ranges of ASCII codes can be set up, allowing any combination of characters to be defined as valid.

Entering the Program

Xinput is written entirely in machine language. To enter it, use MLX, our machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts, enter the following values.

Starting address: CC08 Ending address: CECF

Be sure to save a copy of the program before you exit MLX.

Using Xinput

To use Xinput in your BASIC program, first load it into memory with the ,8,1 ex-

tension. Type in or study the demonstration program that follows the Xinput listing. It shows how to use Xinput from within a program.

The demo is written in BASIC. To help avoid typing errors, enter it with The Automatic Proofreader; again see "Typing Aids." Note that line 430 completely fills two screen lines. You might want to use a question mark as an abbreviation for PRINT when entering that line. To get the correct Proofreader checksum, after you've entered line 430, list it, cursor back to it, and press Return.

The XINPUT command requires the following format.

SYS 52232, X, Y, L, S\$

The X and Y represent the row and column at which the input field will start. X may be 0–24 and Y 0–39. L is the maximum length of the string that can be entered. This can be 2–255 characters in length

S\$ is the variable in which the string will be returned. If S\$ contains a string prior to using the XINPUT command, that string will be placed in the input field as the default string. If the default string is longer than the specified maximum string size, it will be truncated.

When the XINPUT command is executed, an input field appears on the screen in reverse video. The user can type in any valid keys (see below) and use any of the editing keys. The user won't be able, however, to move the cursor out of the input field.

If you attempt to place the input field in such a position that it cannot fit on the screen, you will get an *ILLEGAL QUANTITY ERROR* message. For example, SYS 52232,24,0,41,L\$ will produce an error condition.

Is It Valid?

To control the characters that can be typed in, you must define the range of ASCII codes that will be considered valid. For example, to allow entry of only the unshifted alphabet, the range would be 65 (the ASCII value for a) to 90 (ASCII for z). If you want to declare a single, isolated character as valid, its ASCII code would be both the upper and the lower limit of the range. To include the space bar, for example, the

range would be 32–32. Up to 25 separate ranges can be defined.

To set up these ranges, first poke the number of ranges into 52940. Then poke the lower limit followed by the upper limit of the first range into the next two locations. Similarly, poke the lower and upper limits of each range into successive locations.

Because of the way in which characters are stored by BASIC, you must use the codes 192–223 for the shifted keys, rather than codes 96–127.

The easiest way to poke the correct values is to set up a string consisting of the characters at the lower and upper limits of each range and then call a subroutine similar to the one starting at line 520 in the demo program. For example, to allow only the lowercase alphabet, the digits, and the space bar, use AL\$="AZ 09": and the a GOSUB to your subroutine. The demo program shows other examples.

If the default string contains any outof-range characters, they will be removed by Xinput. If you poke 52960 with 0 or any number greater than 25, all keys will become valid.

A Little Extra

If you simply want to position the cursor anywhere on the screen, use the XINPUT command and leave out the last two parameters and preceding comma —for example, SYS 52232,9.8.

The speed with which the cursor blinks can be changed by poking a number into location 52579. The fastest blink rate is 1, and 255 is the slowest. The default value is 60.

Xinput uses memory from 52941 to 53247 for temporary storage.

XINPUT

CCØ8:20	FD	AE	20	9E	B7	86	Ø2	EB	
CC10:20	FD	AE	20	9E	B7	8A	A8	A2	
CC18:84	03	A6	02	EØ	19	BØ	3D	B3	
CC20:C0	28	BØ	39	18	20	FØ	FF	FØ	
CC28:18	A9	ØØ	65	03	85	FD	A9	62	
CC30:04	69	ØØ	85	FE	A5	02	FØ	02	
CC38:11	18	A5	FD	69	28	85	FD	E9	
CC40:A5	FE	69	00	85	FE	C6	02	51	
CC48:DØ	EF	AØ	00	Bl	7A	C9	2C	91	
CC50:F0	01	60	20	FD	AE	20	9E	3A	
CC58:B7	EØ	02	BØ	05	A2	ØE	4C	6C	
CC69:37	A4	CA	8E	C9	CE	18	A5	60	
CC68:FD	6D	C9	CE	85	FB	A5	FE	E8	
CC70:69	00	85	FC	A5	FC	C9	07	FA	
CC78:FØ	04	BØ	ØC	90	ØD	A5	FB	62	
CC80:C9	E7	FØ	07	BØ	02	90	03	39	

```
CC88:4C 5D CC AD CC CE C9 1A 63
CC90:90 05 A9 00 8D CC CE AC D2
CC98:C9 CE A9 AØ 91 FD A9 2Ø Ø2
              88
                  DØ F4 99 FF
CCAØ: 99 FF CE
                                F6
        A9
           AØ
CCA8:CE
               91
                  FD 8C
                        C7
                            CE
                               CI
CCBØ: 20 FD
           AE
              20
                  8B BØ A6 ØD
CCB8:E8 FØ
            95
               A2 16
                     4C
                         37
                            A4
                               C2
CCCØ: A5
        5F
            85
               FB
                  A5
                     60
                        85 FC
                                20
CCC8: AØ Ø2 B1 FB CD C9 CE 9Ø EC
                     8A 8D
                            CB
CCDØ: Ø5 AE C9
               CE
                  E8
CCD8:CE AA
           FØ
               28 C8
                     B1
                        FR 85
                                AF
CCE0:04 C8 B1 FB 85 05 A0 00
CCE8:84 Ø3 8C CA CE A4 Ø3 B1
                                84
CCFØ: 04 AC
            CA
               CE
                  20 07
                        CD E8
                                9F
CCF8:FØ Ø1 C8 E6 Ø3 A5 Ø3 CD
CD00:C8 CE D0 E6 4C 83 CD 84 CC
CDØ8:02 AC
            CC
               CE
                  FØ
                     10
                         A2
                            91
                                94
CD10:DD CC
            CE
              BØ
                  04 E8
                        4C 21
CD18:CD E8 DD CC CE 90
                        OR FO
                               10
CD20:09
        E8
            88
               DØ
                  EB
                     A4
                         02
                            A2
                               31
CD28:FF
        60
           A4 Ø2 99
                     FF
                        CE C9
           ab ca ca Ba a6 38
CD30:40 90
                                5B
CD38:E9
            4C
               40
                  CD
                     38
                         E9
                            80
         40
CD40:09 80
           91 FD A2 00 60 AC
                               15
CD48:C7 CE B1 FD 49
                     80 91
                            FD FE
CD50:60
         20
            47
               CD
                  A9
                     aa
                         85
                            C6
                                09
           AA 85 Ø3
                     E6 02 D0
CD58:85 02
                               6D
CD60:0C E8
            EG
               3B DØ
                     07
                         20
                            47
                                36
CD68:CD E6
            03
               A2
                  aa
                     A5
                         C6
                            FØ
                                44
           Ø3 4A BØ Ø3 2Ø 47
CD70:EC A5
                     AØ
CD78:CD AD
               a2 C9
                        Da
                            92
                               E9
            77
CD80:A9
         20
            60
               20
                  51
                     CD
                         C9
                            1D
CD88:DØ
        ØE
           AD
               C7
                  CE CD
                         C9 CE
                               52
CD90:B0 F1 EE C7 CE 4C 83 CD D7
               ØD
                         CE
                            C9
CD98:C9
        9D
            DØ
                  AD
                     C7
CDAØ: ØØ FØ EØ CE C7
                     CE 4C
                            83
                               17
                        90
CDA8:CD AE C9 CE EØ 28
                            38
                               FD
CDBØ:C9
        91
            DØ
               13
                  AD
                     C7
                         CE
                            C9
                               D4
CDB8:28 90 C8 38 AD C7 CE E9
                               30
CDCØ: 28 8D C7 CE 4C 83 CD C9
                               8F
CDC8:11
        DØ
           1D
               38
                  AD
                     C9
                         CE
                            E9
                                64
CDD0:27
        8D CB CE AD C7
                         CE
                            CD
                               C1
CDD8:CB CE BØ A7 18 AD C7
                            CE
                               74
                         83
CDE0:69
         28
            8D
               C7
                  CE
                      4C
                            CD
                     C7
CDE8: C9
        14 DØ 2B AE
                         CE
                            FØ
                               5E
CDFØ:F4 8A A8 CA B1 FD 88
                            91
                               93
CDF8:FD
        C8
            B9
               FF
                  CE
                      9D
                         FF
                            CE
                                B8
CEØØ:E8 C8
           EC
               C9 CE
                     90
                        ED
                            88
                               98
CEØ8: A9 AØ
           91 FD A9
                     20 99
                            FF
                               B5
CE10:CE
        CE
            C7
               CE
                  4C
                     83
                         CD
                            C9
                                84
            45 AC C9
CE18:94 DØ
                     CE B1 FD
                               92
CE20:C9 AØ FØ Ø3 4C 83 CD AE D3
CE 28:C9
        CE
            CA
               8A A8
                     E8
                               A7
CE30:C7
        CE
            8D CA CE
                     EE
                        CA
                            CE
                               5A
CE38:A9 00 85 02 B1 FD C8 91
                               24
CE40:FD
        88
           B9
               FF
                  CE
                     90
                         FF
                            CE
                               FI
CE48:CA 88
           E6
               92
                  A5
                     92
                         CD
                            CA
                               96
CE50:CE DØ
            E9 C8 A9 AØ 91 FD
                               44
CE58:A9
        20
            99
                  CE
                     4C
                         83
                               82
CE60:C9 ØD DØ
               03
                  4C
                     7B
                        CE
                            AC
                               ØB
CE68:C7 CE
            20 07
                  CD E8 FØ
                            98
                               ØE
CE70:CC
        C9
           CE
              Ba
                  93
                     4C
                         92
                            CD
                               aR
CE78:4C 83 CD AC C9 CE B9
                            FF
                               9E
CE80:CE C9
            20 D0 04 88
                        4C
                            7E
                               62
CE88:CE
        C8
            8C
               C8 CE DØ
                        07
                            84
                               2A
CE90:04
        84
            95
               4C
                  B5
                     CE
                         38
                            A5
                               B5
CE98:33 ED C8 CE
                  85
                     33
                         85
                            04
                               59
        34
           E9
               00 85
                         85
                            05
CEAØ: A5
                     34
                               68
CEA8:AØ
        00 B9 FF CE 91
                         94
                            C8
                               5B
CEBØ:CC C8 CE DØ F5 AØ Ø2 AD B1
```

CEB8:C8 CE 91 FB C8 A5 04 91 D6 CECØ: FB C8 A5 Ø5 91 FB 60 Ø2 D2 CEC8:01 04 FF 00 FF 00 00 00 E7 XINPUT DEMO PK 5 REM COPYRIGHT 1993 - COMP UTE PUBLICATIONS INTL LTD - ALL RIGHTS RESERVED GG 10 IF LL= 0 THEN LL=1:LOAD" XINPUT",8,1 FG 20 POKE650,128: PRINTCHR\$ (14):PRINTCHR\$(8) KD 30 XX=52232 XE 40 PRINT" {CLR}": POKE 53281,0 : POKE 53280, 0: POKE 646, 1 AK 50 SYSXX,0,15:PRINT"{RVS}XI NPUT" MJ 60 SYSXX, 3, 0: PRINT "XINPUT I S A REPLACEMENT FOR THE {SPACE}BASIC PB 70 PRINT: PRINT"INPUT COMMAN D. IT PROVIDES COMPLETE {SPACE}" EE 80 PRINT: PRINT"CONTROL OVER THE INPUT PROCESS. AJ 90 PRINT: PRINT: PRINT" {4 SPACES}WHAT IS YOUR N AME? " GS 100 SYSXX, 13, 2: PRINT "YOU M AY USE ONLY " PG 110 SYSXX, 15, 3: PRINT"THE UP PERCASE/LOWERCASE ALPHA BET KEYS" FQ 120 SYSXX, 16, 3: PRINT "AND TH E SPACE BAR." XS 130 SYSXX, 18, 0: PRINT"USUAL {SPACE}EDITING & CURSOR KEYS ARE ACTIVE." RE 140 AL\$="AZAZ{2 SPACES}":GO SUB520 EJ 150 SYSXX, 10, 23, 15, N\$ FM 160 REM-LONG GJ 170 PRINT" {CLR}OK, ";N\$;" {SPACE}NOTE THAT XINPUT CAN" HS 180 PRINT"HANDLE STRINGS OF LENGTH UP TO 255":PRIN T"CHARACTERS." PB 190 PRINT: PRINT"ENTER A LON G STRING. (THIS TIME"; CA 191 PRINT" ONLY THE LOWERCA SE ALPHABET & NUMBERS C AN BE" FQ 192 PRINT" ENTERED.)" 200 SYSXX, 20, 0: PRINT "REMEMB ER THAT {RVS}CRSR UP, D OWN LEFT, RIGHT (OFF) KE YS AND "; ME 210 PRINT"THE (RVS) INSERT & DELETE KEYS (OFF) {3 SPACES}ARE ACTIVE." DP 220 ALS="AZ{2 SPACES}09":GO SUB520 SD 230 SYSXX, 10,0,255, N1\$ KS 240 PRINT" [CLR] YOU ENTERED

GE 250 PRINTN1\$: GOSUB480 KB 260 AA 270 REM-RANGE FA 280 PRINT" {CLR}YOU HAVE FUL L CONTROL OVER CHARACTE RS{3 SPACES}THAT CAN BE ENTERED." KA 290 PRINT" [DOWN] [5 SPACES]E NTER A NUMBER IN EXPONE NT FORM," MG 300 PRINT"SUCH AS -6.254 E+ 10. PRINT" [DOWN] {RVS}THE FO LLOWING KEYS ARE ACTIVE CQ 320 PRINT" [DOWN] {2 SPACES } N UMBER KEYS RM 330 PRINT"{2 SPACES}PLUS & {SPACE } MINUS KEYS GC 340 PRINT" {2 SPACES}THE LET TER E RR 350 PRINT" {2 SPACES} THE DEC IMAL POINT MQ 360 ALS="09{2 SPACES}EE-.++ ":GOSUB520 RP 370 SYSXX, 16, 0, 15, N2\$ CH 380 SYSXX, 18,0 : PRINT "YOU E NTERED THE FOLLOWING NU MBER: {DOWN}" JD 390 PRINTN2\$: GOSUB480 XK 400 : EJ 410 REM-FINAL PRINT" {CLR}XINPUT ALSO PE 420 {SPACE}OFFERS A DEFAULT STRING." AQ 430 PRINT"ENTER A STRING US ING ONLY THE {RVS}SPACE BAR{OFF} & {RVS}LOWERC ASE ALPHABET KEYS (OFF) " HC 440 ALS="{2 SPACES}AZ":GOSU B520 JR 450 N3\$="DEFAULT STRING": {2 SPACES}SYSXX,09,5,30 , N3\$ EP 460 SYSXX, 13, 0: PRINT "YOU EN TERED THE STRING [DOWN] " :PRINTN3\$:GOSUB480 JB 470 PRINTCHR\$ (142): PRINTCHR \$(9):PRINT"DEMO OVER":E ND HQ 480 SYSXX, 23, 8: PRINT" (RVS)P RESS ANY KEY TO GO ON": POKE198, Ø: WAIT198, 1: POK E198,0 FF 490 RETURN FA 500 : DE 510 REM INCLUDE THIS SUBROU TINE IN YOUR OWN PROGRA MS EE 520 AL=LEN(AL\$): IF (AL AND 1) = 1 THENPRINT" {RVS}BAD LENGTH FOR XINPUT":STO PF 530 FOR R= 1 TO AL KR 540 POKE52940+R, ASC (MID\$ (AL \$,R,1)) JE 550 NEXT

FF 560 POKE52940,AL/2 JM 570 RETURN

Farid Ahmad is a mechanical engineer in Islamabad, Pakistan, and he's seeking employment. He says the 64 is a great help for filling the vacant hours and keeping mentally active.

SPIRALS

By Frederic Isaman

Spirals for the 128 is a simulation of a Spirograph set, allowing you to draw intricate geometric designs on the computer screen. Spirals duplicates most of the features of those old sets and also adds new ones, and you never have to worry about your pen slipping!

Spirals is written entirely in BASIC 7.0. To help you avoid typing errors, enter it with The Automatic Proofreader. See "Typing Aids" elsewhere in this section. Be sure to save a copy of the program be-

fore you exit Proofreader.

Spirals acts by mathematically simulating the act of rotating a wheel around a stationary circle called the rim. An imaginary pen is set into the wheel, and its path is traced onto the screen. The disk can be set inside or outside the stationary rim, and the pen can be set anywhere within the wheel.

Because this is only a simulation, you can even set the pen a fixed distance outside the wheel. Finally, results can be altered by changing the number of points the program calculates when drawing the spirals. This feature can make designs rounded or angular.

Go Spiraling

To use the program, just load it and run it. Enter the data that Spirals requests, and watch as the picture draws on the screen.

Here are some points to remember about Spirals' prompts. *Rim radius* is the radius of the stationary circle. *Wheel radius* is the radius of the rotating disk. *Pen location* is where the pen is put on the wheel. A value of 0 puts it in the center of the wheel, and a value equal to the radius of the wheel puts it on the edge.

Pen color is assigned with the same numbers used by Commodore's COL-OR command. Number of points drawn is a measure of how smooth or

RING: {DOWN}"

{SPACE}THE FOLLOWING ST

choppy the picture will be. The higher the number, the smoother and more realistic the picture. Very interesting results can occur if you make the choppiness extreme, using values less than 10 or so.

The program then asks where you want the wheel. It can be placed to rotate either outside or inside the rim.

Finally, you are asked if you wish to clear the screen before starting. Spirals then goes to the graphics screen and begins to draw. You can halt drawing by pressing the space bar. Press it again to restart.

When a drawing has finished, you can start a new spiral by pressing Return. When you do, you'll see the parameters that you've just entered. To alter a parameter while leaving the others as they were, press Return until the desired parameter appears.

It's important to note that when a spiral is drawn and the screen cleared, the screen is scaled so that the spiral will occupy the whole screen. The program will keep this scale factor until the next time the screen is cleared. Thus, if you draw several spirals without clearing the screen, you must draw the largest one first in order to set the screen's scale correctly.

Finally, if circles are distorted into ovals, you can remedy this by drawing a circle, measuring its height and width, and using the value of the width divided by the height in place of the 1.12 in line 140.

Here are a few sample settings to show what can be accomplished and how the various parameters are used. The following are replies given to prompts asking for the rim radius, wheel radius, pen location, number of points, and whether or not the wheel should be outside the rim.

200,45,245,20,N 200,45,245,40,N 200,70,270,20,N 100,124,200,5,N 200,245,350,5,N 200,20,220,60,N 200,5,100,25,Y 200,5,100,200,Y 200,270,470,10,N

Experiment by changing any of these numbers to create new spirals.

SPIRALS

- PK 5 REM COPYRIGHT 1993 COMP UTE PUBLICATIONS INTL LTD - ALL RIGHTS RESERVED
- PX 10 GOTO180
- SJ 20 DRAW1,XM+LR-IR+E,YM:DF=L R-IR:DR=LR/IR-1
- GJ 30 DO:T=T+S:TM=DR*T:X=DF*CO S(T)+E*COS(TM):Y=DF*SIN(T)-E*SIN(TM):GOTO60
- CS 40 DRAW1, XM+LR+IR-E, YM:DF=L R+IR:DR=LR/IR+1
- KG 50 DO:T=T+S:TM=DR*T:X=DF*CO S(T)-E*COS(TM):Y=DF*SIN(T)-E*SIN(TM)
- EE 60 DRAW TOX+XM, Y+YM
- CJ 70 GETAS: IFAS=CHR\$(13) THEN1
- QX 80 IFA\$=" "THENWT=1-WT
- GC 90 IFWTTHEN70
- KG 100 LOOP UNTIL A\$=CHR\$(13): GRAPHIC0:GOTO190
- BE 110 PRINT"BACK COLOR? (1-16)?"BC%:PRINT"{UP}"TAB(1 8):INPUTBC%:IF(BC%<1)OR (BC%>16)THEN110
- RH 120 COLORØ, BC%: COLOR4, BC%: Q Q=0
- JS 130 IFX\$="Y"THENYM=LR-IR+AB S(E):ELSE YM=LR+IR+ABS(
- PE 140 XM=YM*1.12:IFXM<160THEN
 PRINT"VALUES TOO SMALL.
 {2 SPACES}TRY AGAIN.":Q
 O=1
- GH 150 IFXM>16383THENPRINT"VAL UES TOO LARGE. {2 SPACES}TRY AGAIN.":Q O=1
- GR 160 IFQQ=0THENGRAPHIC1,1
- RB 170 RETURN
- KJ 180 DIMT,TM,E,DF,X,Y,DR,XM, YM,S:X\$="N":C\$="Y":CL%= 2:BC%=1
- MG 185 LR=200:IR=45:E=245:D=20
 DP 190 PRINT"RIM RADIUS?"LR:PR
 INT"{UP}"TAB(10);:INPUT
- BK 200 PRINT"WHEEL RADIUS?"IR: PRINT"{UP}"TAB(12);:INP
- UTIR
 HF 210 PRINT"PEN LOCATION?"E:P
- RINT" {UP}"TAB(12);:INPU
 TE
 SP 220 PRINT"PEN COLOR? (1-16)
- ?"CL%:PRINT"{UP}"TAB(17):INPUTCL%:IF(CL%<1)OR(CL%>16)THEN220
- XX 230 COLOR1,CL%
- BA 240 PRINT"PLOT HOW MANY POI NTS?"D:PRINT"{UP}"TAB(2 0);:INPUTD:IFD=0THEN240
- QJ 250 PRINT"WHEEL INSIDE RIM? (Y/N)? "X\$:PRINT"{UP}" TAB(23):INPUTX\$
- KC 260 IFX\$<>"Y"ANDX\$<>"N"THEN

- DD 265 IF(XS="Y")AND(IR>=LR)TH ENPRINT"RIM MUST BE LAR GER THAN WHEEL.":GOTO20
- DH 270 PRINT"CLEAR SCREEN? (Y/N)? "C\$:PRINT" {UP}"TAB(19):INPUTC\$
- BX 280 IFCS="N"THEN330
- JH 290 IFC\$="Y"THENGOSUB110:EL SE270
- JS 300 IFQQTHEN190
- QJ 310 WT=0:T=0:S=2*1/D:SCALE1 ,XM*2,YM*2
- FJ 320 IFXS="N"THEN40:ELSE20
- SP 330 QQ=0:IFXS="Y"THENIFYM<L R-IR+ABS(E)THENQQ=1
- PC 340 IFX\$="N"THENIFYM<LR+IR+
 ABS(E)THENQQ=1
- RA 350 IFQQ=0THENGRAPHIC1,0:GO TO310
- MK 360 PRINT"SPIRAL LARGER THA N SCREEN. TRY AGAIN.":G OTO190

Frederic Isaman creates spirals and computer programs in Holland, New York.

ONLY ON DISK

Here are the bonus programs on this month's Gazette Disk.

Runestone

By John Cameron Newcastle, NB, Canada

Magical runestones in this two-player strategy game attack, bless, or eradicate areas of the playing field.

Electronic Billboard

By Bob Markland Newcastle, WY

This multifeatured message display uses sprites for big letters without jaggies.

TYPING AIDS

MLX, our machine language entry program, and The Automatic Proofreader are utilities that help you enter Gazette programs without mistakes. MLX is listed in this issue. For a free printed copy of Proofreader, send a self-addressed, stamped envelope to Typing Aids, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

Machine Language Entry Program MLX for Commodore 64

Ottis R. Cowper

Type in and save some copies of MLX-vou'll want to use it to enter future ML programs from Gazette. When vou're ready to enter an ML program. load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine lanquage, the addresses (and all other values vou enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to these numbers are in hexadecimal-a base 16 numbering system commonly used by ML programmers, Hexadecimalhex for short-includes the numerals 0-9 and the letters A-F. But even if you know nothing about ML or hex, you should have no trouble using MLX.

After vou've entered the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option. A functions menu will appear. The first option in the menu is Enter Data. If you're just starting to type in a program, pick this. Press the E key and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you stopped typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing Return alone when asked for the address. (You can get back to the menu from most options in the program by pressing Return with no other input.)

Entering a Listing

Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the co-Ion (:). Each line represents eight data bytes and a checksum. Although an

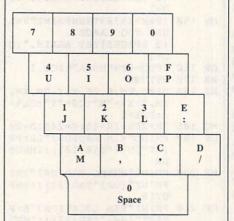
MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing.

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You do not type spaces between the columns; MLX automatically inserts these for you. You do not press Return after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

64 MLX Keypad



Only the numerals 0-9 and the letters A-F can be entered. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, a numeric keypad function is included. The keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figure below shows the keypad configuration.

MLX checks for transposed characters. If you're supposed to type in A0

and instead enter OA, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take care while entering data.

Editing Features

To correct typing mistakes before finishing a line, use the Inst/Del key to delete the character to the left of the cursor. If you mess up a line badly, press Clr/Home to start the line over. The Return key is also active, but only before any data is typed on a line. Pressing Return at this point returns you to the command menu. After you type a character, MLX disables Return until the cursor returns to the start of a line. Remember, press Clr/Home to quickly get to a line-number prompt. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing and then move the cursor to the mistake and type the correct key. The cursor- left and -right keys provide the normal cursor controls. (The Inst/Del key now works as an alternative cursorleft key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, Return is active; pressing it tells MLX to recheck the line. You can press the Clr/Home key to clear the entire line if you want to start from scratch or if you want to get to a linenumber prompt to use Return to get back to the menu.

Display Data

The second menu choice, Display Data, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press the space bar again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press Return.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are Save File and Load File. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save. This is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. Also note that the drive prefix 0: is added to the filename (line 750), so this should not be included when entering the name. This also precludes the use of @ for save-with-replace, so be sure to give each version saved a different name.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When you're saving a partially completed listing, make sure to note the address where you stopped typing.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. It also has three special load error messages: INCORRECT STARTING AD-DRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT address, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING AD-DRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The Quit menu option has the obvious effect—it stops MLX and enters BA-SIC. The Run/Stop key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, Run/Stop-Restore also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or press any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the Clear Workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready for the results. Refer to the corresponding article for details on loading and running the program.

An Ounce of Prevention

Don't take chances—use The Automatic Proofreader to type the new MLX, and then test your copy thoroughly before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses; then use the display option to verify that the data has been entered correctly. Test the save and load options to ensure that you can recall your work from disk.

64 MLX

- SS 10 REM VERSION 1.1: LINES 8 30,950 MODIFIED, LINES 4 85-487 ADDED
- EK 100 POKE 56,50:CLR:DIM IN\$, I,J,A,B,A\$,B\$,A(7),N\$
- DM 110 C4=48:C6=16:C7=7:Z2=2:Z 4=254:Z5=255:Z6=256:Z7= 127
- CJ 120 FA=PEEK(45)+Z6*PEEK(46)
 :BS=PEEK(55)+Z6*PEEK(56)
 :H\$="0123456789ABCDEF"
- SB 130 R\$=CHR\$(13):L\$="{LEFT}"
 :S\$=" ":D\$=CHR\$(20):Z\$=
 CHR\$(0):T\$="{13 RIGHT}"
- CQ 140 SD=54272:FOR I=SD TO SD +23:POKE I,0:NEXT:POKE {SPACE}SD+24,15:POKE 78 8,52
- FC 150 PRINT" {CLR} "CHR\$ (142) CH R\$ (8): POKE 53280,15: POK E 53281,15
- EJ 160 PRINT T\$" {RED} {RVS} {2 SPACES} {8 @}

{2 SPACES}"SPC(28)"
{2 SPACES}{OFF}{BLU} ML
X II {RED}{RVS}
{2 SPACES}"SPC(28)"
{12 SPACES}{BLU}"

FR 170 PRINT"{3 DOWN}
{3 SPACES}COMPUTE!'S MA
CHINE LANGUAGE EDITOR
{3 DOWN}"

JB 180 PRINT" {BLK} STARTING ADD
RESS {4}";: GOSUB300: SA=A
D: GOSUB1040: IF F THEN18

GF 190 PRINT"{BLK}{2 SPACES}EN
DING ADDRESS{4}";:GOSUB
300:EA=AD:GOSUB1030:IF
{SPACE}E THEN190

{SPACE}F THEN190

KR 200 INPUT"{3 DOWN}{BLK}CLEA
R WORKSPACE [Y/N]{4}";A
\$:IF LEFT\$(A\$,1)<>"Y"TH
EN220

PG 210 PRINT"{2 DOWN}{BLU}WORK ING...";:FORI=BS TO BS+ EA-SA+7:POKE I,0:NEXT:P

DR 220 PRINTTAB(10)"{2 DOWN}

{BLK}{RVS} MLX COMMAND

{SPACE}MENU {DOWN}{4}":

PRINT T\$"{RVS}E{OFF}NTE

R DATA"

BD 230 PRINT T\$"{RVS}D{OFF}ISP LAY DATA":PRINT T\$" {RVS}L{OFF}OAD FILE"

JS 240 PRINT T\$"{RVS}S{OFF}AVE FILE":PRINT T\$"{RVS}Q {OFF}UIT{2 DOWN}{BLK}"

JH 250 GET A\$:IF A\$=N\$ THEN250 HK 260 A=0:FOR I=1 TO 5:IF A\$= MID\$("EDLSQ",I,1)THEN A =I:I=5

FD 270 NEXT:ON A GOTO420,610,6 90,700,280:GOSUB1060:GO TO250

EJ 280 PRINT" (RVS) QUIT ": INPU T" (DOWN) (4) ARE YOU SURE [Y/N]"; A\$: IF LEFT\$ (A\$, 1) <> "Y"THEN220

EM 290 POKE SD+24,0:END

JX 300 IN\$=N\$:AD=0:INPUTIN\$:IF LEN(IN\$)<>4THENRETURN

PP 320 A=0:FOR J=1 TO 2:A\$=MID \$(B\$,J,1):B=ASC(A\$)-C4+ (A\$>"0")*C7:A=A*C6+B

JA 330 IF B<0 OR B>15 THEN AD= 0:A=-1:J=2

GX 340 NEXT: RETURN

CH 350 B=INT(A/C6):PRINT MID\$(
H\$,B+1,1);:B=A-B*C6:PRI
NT MID\$(H\$,B+1,1);:RETU
RN

RR 360 A=INT(AD/Z6):GOSUB350:A =AD-A*Z6:GOSUB350:PRINT ":":

BE 370 CK=INT (AD/Z6):CK=AD-Z4* CK+Z5*(CK>Z7):GOTO390

- PX 380 CK=CK*Z2+Z5*(CK>Z7)+A JC 390 CK=CK+Z5* (CK>Z5): RETURN QS 400 PRINT" [DOWN] STARTING AT {4}"::GOSUB300:IF INS<> NS THEN GOSUBIASA: IF F (SPACE) THEN 400 EX 410 RETURN HD 420 PRINT" (RVS) ENTER DATA {SPACE}":GOSUB400:IF IN \$=N\$ THEN220 JK 430 OPEN3,3:PRINT SK 440 POKE198,0:GOSUB360:IF F THEN PRINT INS: PRINT" {UP}{5 RIGHT}"; GC 450 FOR I=0 TO 24 STEP 3:B\$ =S\$:FOR J=1 TO 2:IF F T HEN B\$=MID\$(IN\$, I+J, 1) HA 460 PRINT" [RVS] "B\$L\$;:IF I< 24THEN PRINT" {OFF}"; HD 470 GET AS: IF AS=NS THEN470 FK 480 IF (AS>"/"ANDAS<":") OR (A \$>"@"ANDA\$<"G") THEN540 GS 485 A=- (AS="M") -2* (AS=" 3* (A\$=".") -4* (A\$="/") -5 * (A\$="J") -6* (A\$="K") FX 486 A=A-7*(A\$="L")-8*(A\$=": ") -9* (AS="U") -10* (AS="I ")-11*(A\$="0")-12*(A\$=" P") CM 487 A=A-13*(A\$=S\$):IF A THE N AS=MIDS ("ABCD123E456F Ø",A,1):GOTO 540 MP 490 IF A\$=R\$ AND ((I=0) AND (J =1)OR F)THEN PRINT BS;: J=2:NEXT: I=24:GOTO550 KC 500 IF AS="{HOME}" THEN PRI NT B\$:J=2:NEXT:I=24:NEX T:F=0:GOTO440 MX 510 IF (A\$="{RIGHT}") ANDF TH ENPRINT B\$L\$;:GOTO540
- GK 520 IF A\$<>L\$ AND A\$<>D\$ OR ((I=Ø)AND(J=1))THEN GOS UB1060:GOTO470 HG 530 A\$=L\$+S\$+L\$:PRINT B\$L\$; :J=2-J:IF J THEN PRINT {SPACE}L\$;: I=I-3 QS 540 PRINT AS; : NEXT J: PRINT (SPACE)SS: PM 550 NEXT I:PRINT:PRINT" [UP] {5 RIGHT}";:INPUT#3,IN\$:IF IN\$=N\$ THEN CLOSE3: GOTO220 OC 560 FOR I=1 TO 25 STEP3:B\$= MID\$(IN\$,I):GOSUB320:IF I < 25 THEN GOSUB380:A(I /3) = APK 570 NEXT: IF A<>CK THEN GOSU Bl060: PRINT" (BLK) (RVS) {SPACE}ERROR: REENTER L INE {4}":F=1:GOTO440 HJ 580 GOSUB1080:B=BS+AD-SA:FO R I=Ø TO 7: POKE B+I, A (I):NEXT OO 590 AD=AD+8:IF AD>EA THEN C LOSE3: PRINT" (DOWN) (BLU) ** END OF ENTRY ** {BLK}

{2 DOWN}":GOTO700

- QA 610 PRINT"{CLR}{DOWN}{RVS}
 {SPACE}DISPLAY DATA ":G
 OSUB400:IF INS=N\$ THEN2
 20
 RJ 620 PRINT"{DOWN}{BLU}PRESS:
 {RVS}SPACE{OFF} TO PAU
 SE, {RVS}RETURN{OFF} TO
- BREAK{4}{DOWN}"

 KS 630 GOSUB360:B=BS+AD~SA:FOR
 I=BTO B+7:A=PEEK(I):GOS
 UB350:GOSUB380:PRINT S\$
- CC 640 NEXT:PRINT"{RVS}";:A=CK
 :GOSUB350:PRINT
- KH 650 F=1:AD=AD+8:IF AD>EA TH ENPRINT"{DOWN}{BLU}** E ND OF DATA **":GOTO220
- KC 660 GET A\$: IF A\$=R\$ THEN GO SUB1080: GOTO 220
- EQ 670 IF A\$=\$\$ THEN F=F+1:GOS UB1080
- AD 680 ONFGOTO630,660,630 CM 690 PRINT"{DOWN}{RVS} LOAD {SPACE}DATA ":OP=1:GOTO
- 710
 PC 700 PRINT"{DOWN}{RVS} SAVE
 {SPACE}FILE ":OP=0
- RX 710 INS=NS:INPUT"{DOWN}FILE NAME{4}";INS:IF INS=NS {SPACE}THEN220
- PR 720 F=0:PRINT"{DOWN}{BLK} {RVS}T{OFF}APE OR {RVS} D{OFF}ISK: {4}";
- FP 730 GET A\$:IF A\$="T"THEN PR INT"T{DOWN}":GOTO880
- HQ 740 IF A\$<>"D"THEN730
 HH 750 PRINT"D{DOWN}":OPEN15,8
 ,15,"I0:":B=EA-SA:IN\$="
 0:"+IN\$:IF OP THEN810
- SQ 760 OPEN 1,8,8,IN\$+",P,W":G OSUB860:IF A THEN220
- FJ 770 AH=INT(SA/256):AL=SA-(A H*256):PRINT#1,CHR\$(AL) ;CHR\$(AH);
- PE 780 FOR I=0 TO B:PRINT#1,CH R\$(PEEK(BS+I));:IF ST T HEN800
- FC 790 NEXT:CLOSE1:CLOSE15:GOT 0940
- GS 800 GOSUB1060:PRINT"{DOWN}
 {BLK}ERROR DURING SAVE:
 {4}":GOSUB860:GOTO220
- MA 810 OPEN 1,8,8,IN\$+",P,R":G
 OSUB860:IF A THEN220
- GE 820 GET#1,A\$,B\$:AD=ASC(A\$+Z \$)+256*ASC(B\$+Z\$):IF AD <>SA THEN F=1:GOTO850
- RX 830 FOR I=0 TO B:GET#1,A\$:P OKE BS+1,ASC(A\$+Z\$):IF(I<>B)AND ST THEN F=2:AD =I:I=B
- FA 840 NEXT: IF ST<>64 THEN F=3
 FQ 850 CLOSE1: CLOSE15: ON ABS (F
 >0)+1 GOTO960,970
- SA 860 INPUT#15,A,A\$:IF A THEN
 CLOSE1:CLOSE15:GOSUB10
 60:PRINT"{RVS}ERROR: "A

- GQ 870 RETURN
 EJ 880 POKE183, PEEK (FA+2): POKE
 187, PEEK (FA+3): POKE188,
 PEEK (FA+4): IFOP=0THEN92
- HJ 890 SYS 63466:IF(PEEK(783)A ND1)THEN GOSUB1060:PRIN T"{DOWN}{RVS} FILE NOT
- {SPACE}FOUND ":GOTO690"
 CS 900 AD=PEEK(829)+256*PEEK(8
 30):IF AD<>SA THEN F=1:
 GOTO970
- SC 910 A=PEEK(831)+256*PEEK(83 2)-1:F=F-2*(A<EA)-3*(A> EA):AD=A-AD:GOTO930
- KM 920 A=SA:B=EA+1:GOSUB1010:P OKE780,3:SYS 63338
- JF 930 A=BS:B=BS+(EA-SA)+1:GOS UB1010:ON OP GOTO950:SY S 63591
- AE 940 GOSUB1080:PRINT"{BLU}**
 SAVE COMPLETED **":GOT
- XP 950 POKE147,0:SYS 63562:IF {SPACE}ST>0 THEN970
- FR 960 GOSUBI080:PRINT"{BLU}**
 LOAD COMPLETED **":GOT
 0220
- DP 970 GOSUB1060:PRINT"{BLK} {RVS}ERROR DURING LOAD: {DOWN}{4}":ON F GOSUB98 0,990,1000:GOTO220
- PP 980 PRINT"INCORRECT STARTIN G ADDRESS (";:GOSUB360: PRINT")":RETURN
- GR 990 PRINT"LOAD ENDED AT ";:
 AD=SA+AD:GOSUB360:PRINT
 D\$:RETURN
- FD 1000 PRINT"TRUNCATED AT END ING ADDRESS": RETURN
- RX 1010 AH=INT(A/256):AL=A-(AH *256):POKE193,AL:POKE1 94,AH
- FF 1020 AH=INT(B/256):AL=B-(AH *256):POKE174,AL:POKE1 75,AH:RETURN
- FX 1030 IF AD<SA OR AD>EA THEN
- CR 1040 IF (AD>511 AND AD<6528 0) THEN GOSUB1080: F=0 : RETURN
- HC 1050 GOSUB1060:PRINT" {RVS} {SPACE}INVALID ADDRESS {DOWN} {BLK}":F=1:RETU
- AR 1060 POKE SD+5,31:POKE SD+6
 ,208:POKE SD,240:POKE
 {SPACE}SD+1,4:POKE SD+
 4,33
- DX 1070 FOR S=1 TO 100:NEXT:GO TO1090
- PF 1080 POKE SD+5,8:POKE SD+6, 240:POKE SD,0:POKE SD+ 1,90:POKE SD+4,17
- AC 1090 FOR S=1 TO 100:NEXT:PO KE SD+4,0:POKE SD,0:PO KE SD+1,0:RETURN

GO 600 F=0:GOTO440

BCC AVANTI 486SLC

Just a couple of years ago, a laptop or portable computer had little in common with a desktop model. Essentially, the portables were just make-do, low-power devices used when "real" computers were unavailable. No more! Today, a notebook computer selling for the same price as one of those make-do models of the recent past not only packs the power of a desktop unit but also includes a multitude of enhancements enabling it to serve in both desktop and portable roles. Case in point: the Avanti 486SLC.

The Avanti 486SLC notebook computer from BCC is as aesthetically pleasing as it is powerful-and it's a powerful machine! It's built around the Cyrix 486SLC 25-MHz, 32-bit microprocessor, with all the 486 features intact. On board are an 87SLC math coprocessor for those arithmetic-intensive chores, a high-speed cache controller (on-board cache memory is 1K), and an Advanced Power Management (APM) controller. It has a 21/2-inch hard drive, with a 19-ms average access time.

Most eye-catching about this notebook PC is its well-thought-out physical design. The soft-touch rubberized case is sleek and stream-lined—both stylish and professional. The contoured shape also makes the unit easy to carry. The 80-key layout is neatly arranged and inclined forward for comfort.

My standard of good design is how well a small keyboard approximates the omnipresent 101-key variety. Minor variations in key size and placement aren't usual-

ly a problem, nor is a missing keypad. But I begin throwing fits if major keys are out of place or awkward to actuate. In the case of the Avanti 486SLC, the cursor keys are at the lower right in an inverted-T formation, as they should be. While the Esc, Ctrl, and Alt

connector supplied with the machine.

You're not really inhibited when it comes to the display, either. The unit's own 10-inch nonglare, triple supertwist, backlit LCD has a 9½-inch viewing area and 1:1 aspect ratio. VGA color emulation utilizes 32

The BCC Avanti 486SLC joins other notebook computers that emulate desktop performance in a portable package.

keys occupy familiar positions, the oft-used Home, Page Down, Page Up, and End keys are accessed as special functions on the cursor keys—a very annoying arrangement.

If you hate notebook keyboards regardless of the cleverness of their design, remember that this is a new era of notebook design. You can still enjoy a full-size keyboard by plugging it into a PS/2-type mini-DIN socket on the side of the computer. The very same plug can accommodate a mouse instead—or both keyboard and mouse using a Y

shades of gray—a very sharp and adequate emulation, in most cases. You can time the backlighting to go off at a convenient interval. If an LCD isn't to your liking and there's a VGA monitor available, a handy 15-pin video port on the side allows you complete color VGA capability.

In terms of power management—always a consideration with notebook computers—the Avanti 486SLC uses a nicad battery rated at three to six hours under normal use. It can be fully recharged in an hour's time. The speed of the CPU is

switched automatically as usage allows. There's sleep-mode shutdown of the CPU, video display, hard disk drive, floppy disk drive, and ports. You have complete control of the intervals before it enters sleep mode.

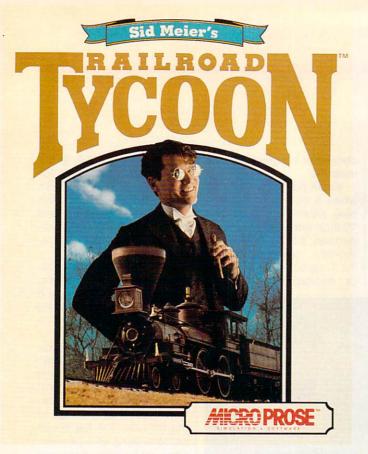
The power button is recessed at the rear of the right side-easy to reach and use, but unlikely to be depressed accidentally. The socket for the keyboard or mouse is on the right side near the front. The 9-pin RS232C serial port, 25-pin parallel port, and video port are located behind a flipdown hatch at the rear of the left side. The hatch can be something of a problem because it hinges open and lies level with the base of the unit and can't be removed for convenience.

The unit also comes with a 9600-bps fax and 2400-bps data modem. You can receive faxes even while the unit is in sleep or suspend mode.

You get an interesting pointing device which can serve as a mouse substitute. It's a hand-held trackball with measurements of about one inch by one inch, and it consists of the trackball with three buttons. The trackball is a tiny plastic thing which works surprisingly well. Two of the buttons correspond to those of a two-button mouse, while the third serves as a lock for dragging.

Directly below the LCD screen lie LED indicators for power, battery charge, low battery, floppy drive access, hard drive access, caps lock, number lock, and scroll lock. On either side at the base of the LCD panel are the brightness and contrast slider controls.

After a month's frequent but typical use, I timed the



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battery and power-warning functions. After powering up at full charge, I used the unit only in spurts.

During that time, the hard drive was accessed for no more than a total of 5 minutes. It took two hours and 45 minutes for my first warning beeps to begin. The final warning beep came 10 minutes later; I had just enough time to append a note to a text file and save the file before the computer shut down entirely. After a complete power-down (even the battery-charge indicator went out), it took an hour and 8 minutes for a full recharge.

The unit, with battery, weighs only about six pounds. It's about 8½ inches deep, 11 inches wide, and 2½ inches high.

In other respects, it's hardly a pint-size lightweight. Although there's room for improvement on the keyboard and it powers down awfully quickly, the Avanti 486SLC from BCC does everything a notebook should do—and does it well.

BRUCE M. BOWDEN

BCC Avanti 486SLC—\$2,295 with 80MB hard drive; \$2,495 with 120MB hard drive; \$2,795 with 200MB hard drive

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SYDOS 44i

There is one and only one immutable law of physics in the universe, one and only one constant true from the depths of the blackest black hole to the wispiest extremes of the most nebulous nebula—or from San Jose to Atlanta: Your hard disk is running out of space.

SyDOS offers several solu-

tions, all removable cartridge drives that work like fixed hard disks yet offer unlimited capacity. Just as with a cassette tape recorder, you have one host unit, but as many cartridges as you want.

I tried the SyDOS 44i—a unit using 44MB cartridges (the *i* is for *internal*). An 88MB drive is also available. I used the 44i on a 40-MHz 386, using the removable drive both as a local drive and as a network directory over a Novell NetWare Lite network.

The unit works the same as fixed hard drives. No special techniques are required for access.

Access times are not blindingly fast, but they're quite acceptable. An average seek time of 20 ms is claimed, and I found the claim to be true. I ran a number of tests copying large, multimegabyte files from and to the 44i, both locally and over the network. A removable drive won't match a big SCSI or ESDI drive in speed, but it will effectively give you a lot of megabytes for less money.

The removable cartridges contain the hard disk platter, which is actually visible through the dark plastic case. The system is just like a regular hard drive in all aspects except that an unlimited number of cartridges can be employed.

SyDOS removable drives are SCSI devices, but an interface board is included that coexists with other types of disk controllers. I installed the SyDOS removable drive without conflict in a machine with an IDE controller. If a SCSI controller is already present, the SyDOS drive uses it instead of the supplied board. Installation is straightforward—merely a

matter of plugging in the board, mounting the drive in an empty bay, and attaching two cables. Running the SyDOS installation software takes only a couple of additional minutes. For those who don't care for even this minimal amount of hardware installation, SyDOS also has units that are completely external and use your computer's parallel port rather than an internal card slot.

The SyDOS and other removable drives offer several advantages. They are better than fixed hard drives in that there is no limit to the amount of room for storing data—simply add additional cartridges as needed. One disadvantage, obviously, is that only 44MB (or whatever the size of the cartridge) is available at any one time. Still, removable drives eliminate or at least put off the need for costly fixed hard disk upgrades. If security considerations are important, sensitive data can be stored on a removable cartridge and the cartridge kept in a safe unless it's actually in use.

Removable cartridges are much better than tape for backup because you can randomly access them (just like a regular hard disk) instead of waiting perhaps hours to find and restore a particular file from tape. (I had to do that yesterday; it's a pain.)

Optical drives offer a lot more storage space (more than 600MB for some) but are three times slower and cost several times more than a SyDOS or other removable cartridge system.

I like the SyDOS 44i. It fills a need many computer owners have. In fact, I like it so well that I'm considering buying one for myself.

RALPH ROBERTS

SyDOS 44i—\$719 for unit with 8-bit adapter and add-on cartridge; additional 44MB cartridges—\$178 each

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REX NEBULAR AND THE COSMIC GENDER BENDER

Rex Nebular, the main character in Rex Nebular and the Cosmic Gender Bender from MicroProse, resembles Han Solo of Star Wars. He's the space smuggler pilot of a specially altered cargo ship called the Slippery Pig, which resembles Solo's Millennium Falcon. Rex is mostly a down-on-his-luck pilot who will do almost anything for money where galactic deliveries are concerned.

Rex gets a request from Colonel Stone, a wealthy Elvis impersonator, to retrieve a valuable vase from Terra Androgena, a planet populated only by xenophobic women. Apparently, Terra Androgena's biology-proficient women killed all the technology-proficient men in the Gender Wars and promptly used a cloaking device to make the planet disappear. In order to reproduce without men, the women invented the extremely distasteful Gender Bender, a machine that turns women into men and vice versa.

Rex discovers Terra Androgena, and his ship is immediately disabled by a planetary defense craft. The Slippery Pig crashes into the sea, and Rex must find the vase on a planet of hostile women. Rex also finds it necessary to use the Gender

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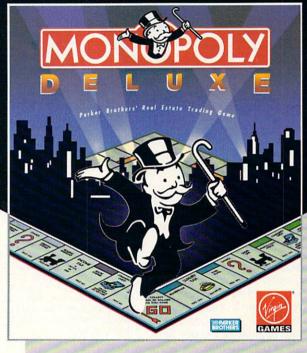
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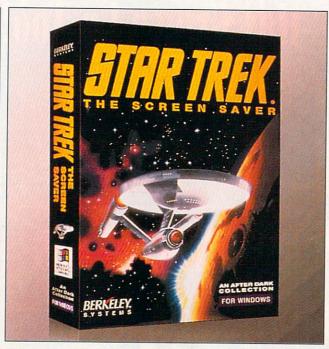
Bender to change into a woman (who resembles graphic adventure game inventor Roberta Williams of Sierra On-Line).

Bug-free Rex Nebular is the first graphic adventure produced by MicroProse, right on the heels of the company's first role-playing adventure, the unfortunately bugridden Darklands. Rex Nebular has very high production standards, and MicroProse has virtually reinvented scanned images with a new graphic rotoscopic process that produces attractive, realistic, and smoothly animated images from filmed actors. The process also integrates the animated images with the backgrounds, blending them into one picture.

The music, which can be turned on or off but has no volume control, is mood enhancing, interesting, and never monotonous, repetitive, or annoying-unlike many of the barnyard noises passing for music in other software. There are enormous number of Foley and electronically produced squashes, splats, thuds, and squeaks. The beginning animation is enhanced by more than a minute of digital speech with simultaneous text display.

The game has both a naughty and a nice mode, either of which might be desired in a game where there is only one man on a planet full of women. The nice mode eliminates the one sexual encounter and most of the gratuitous—and ubiquitous—blood and gore.

The interface uses a mouse-activated, text-constructed parser that combines ten standard action words with object-specific action words to produce text parserlike sentences. The



Captain! Captain! If we don't turn the ship around, we'll never be able to protect the monitor screen from phosphor burn-in!

treasure-hunt puzzles require the player to find objects and discern how they're used. The game has no dead ends; you get second chances to acquire essential artifacts. It can be played in easy, intermediate, or advanced mode. I'd recommend intermediate, since the advanced mode has significantly fewer hints and is more lethal, while the intermediate mode has more interesting puzzles.

There are a variety of interesting characters, such as the intelligent, 12-foot-tall reptilian "buddy beast" that befriends Rex in the female underground complex. Happily, Rex Nebular has no annoying, obligatory arcade sequence. The logically designed connecting scenes are simple but interesting, obviating the need to map or have an automapping utility. Essential items can be maintained and manipulated in the unlimited and versatile inventory. Rex Nebular is highly recommended for novice and advanced players alike. ALFRED C. GIOVETTI

IBM PC or compatible (16-MHz 80286 or faster [20-MHz 80386 or faster recommended]), 640K RAM (uses 575K active), MCGA or VGA, hard disk with 12MB free; supports mouse, supports Roland, Ad Lib, Pro AudioSpectrum, Sound Blaster, and Covox—\$69.95

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Circle Reader Service Number 436

STAR TREK: THE SCREEN SAVER

These days, screen savers are almost as popular as spreadsheet programs and word processors. Walk through any office building, and you'll see many of the computers running After Dark, Intermission, or Windows 3.1's built-in screen saver. Swirling colors, flying

toasters, fractal landscapes, dueling blenders, tropical fish—few computers get any rest during the day.

Berkeley Systems, the developer of After Dark, has created yet another screen saver-this one based on the original "Star Trek" television series. The 15 different modules include Spock walking across your screen, the sick bay's medical readouts, an atlas of planets, the ship's crew stalking the silicon-based horta, Scotty's technical files on various electronic devices and space vehicles, an animated sequence with Kirk in the captain's chair, two Tholian ships entrapping the Enterprise in an energy web, a Starfleet Academy final exam, and, of course, a room filling up with tribbles.

If you're running Windows with an 8-bit (256-color) display card, many of the modules will be of photographic quality. If you have a Windows-compatible sound card, you'll be able to hear digital recordings of Kirk, Spock, Bones, and Scotty. (A PC-speaker sound driver is included, but its performance can vary greatly among computers.) In addition, you can use the Star Trek modules with After Dark.

Whether you need to protect your screen from phosphor burn-in or you're simply a fan of the series, Star Trek: The Screen Saver is a great way to brighten up (and darken) your computer screen. Live long and phosphor!

DAVID ENGLISH

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DUNE

What's so special about a barren planet, some spice, and two warring factions drawing lines in the sand? When combined with the theme of Frank Herbert's renowned novel and Virgin Software's technical wizards, you get the computer version of Dune.

While Dune purists will scoff at any computer (or movie) version of their beloved book, Virgin's Dune flawlessly blends adventure with strategic elements (while taking liberties with the original story). It offers compelling gameplay, good characterizations, and stunning graphics influenced largely by the David Lynch movie. And unlike most movie-based games, it succeeds.

Dune is the sweltering planet whose redeeming feature is its exclusive natural resource-melange. The ability of this spice to prolong life and bend space and time makes it the most valuable

commodity in the universe.

The emperor, who controls the spice, offers mining rights to your House of Atreides. Your bitter rivals, the Harkonnens, have been successfully mining the spice at the expense of the indigenous population-the Fremen tribes, who have been enslaved to extract the ore.

As Paul Atreides, you must provide the leadership to persuade the Fremen to side with you against the Harkonnens and eliminate their threat from the planet. This involves slowly recruiting and building your forces.

But there's more. In return for the right to mine the spice, the emperor demands an ever-increasing percentage of your yield. Cross him, and his collection agency stops at nothing short of killing you (game over) for failing to send his cut. So you must also maintain your shipments of spice and ensure that your forces are diligently mining it.

Supernatural elements al-

so play a key role in the game through visions, mental communication, and the Fremen prophecy of a great leader who will release their people from bondage.

As your forces grow, you have to keep track of your troops and assign them to the various tasks, including prospecting, spice mining, and military training. Besides dealing with the emperor and outright attacks from your friendly neighborhood Harkonnens, there are the giant sand worms (which play an important role later in the game) that destroy your mining operations.

The interface is straightforward and easy to use-especially with a mouse. The main screen depicts the scene through Paul's eyes, and an options window tells you what you can do in each scene.

The game's graphicsparticularly in the character closeups and the travel sequences through various times of the day-are excellent. Also, the music and sound effects are first-rate (with an audio card).

The only negative aspect is the sparse manual. The authors seem far more concerned with providing biographies of the game's designers (who, admittedly, deserve a lot of credit) than adequately explaining how to play the game.

In Dune, the hours fly by like the sands of time, and the game succeeds with a strategic line that is refreshingly different from those of other adventure games, with a strong sense of theme and character.

WAYNE N. KAWAMOTO

IBM PC or compatible, 640K RAM. VGA, hard drive; supports EMS, XMS, mouse, and the following sound cards: Roland MT-32 and LAPC-1, Ad Lib, Ad Lib Gold, Sound Blaster, and Sound Blaster Pro-\$49.99

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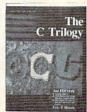
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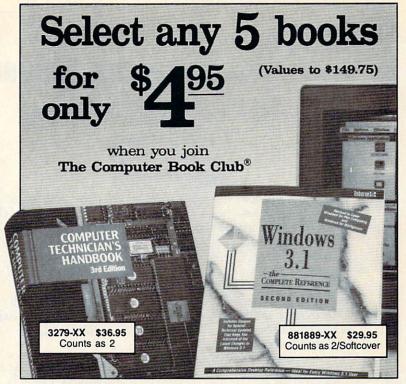
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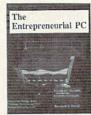
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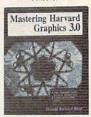
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DACEASY ACCOUNTING 4.3, DACEASY INSTANT ACCOUNTING 1.0

DacEasy Accounting is kind of like the Volvo of inexpensive accounting software. It's not glamorous, and sometimes it's kind of hard to drive, but it's reliable. It works. It's not an overpriced luxury car, but neither is it a Yugo.

DacEasy introduced a sportier, lower-priced model in the spring of 1992. DacEasy Instant Accounting, available in both DOS and Windows versions (bundled in the same package for less than \$50), isn't as powerful or feature packed, but it's a good entry-level product for the individual or small business looking for an accounting package that can be learned quickly and easily recalled upon use.

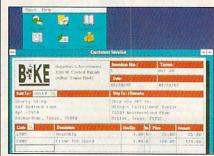
The recent upgrade of DacEasy Accounting contains the same 12 integrated modules found in earlier versions: General Ledger, Accounts Payable, Accounts Receivable, Cash Management, Billing, Inventory, Product Assembly, Purchase Order, Budgeting, Forecasting, Graphics, and Report Generator.

Version 4.3 uses the same menudriven DOS user interface with lookup windows for easy access to lists of such things as customers, vendors, products, and services. New features include a dramatic increase in print speed, the ability to print multiple copies of the same invoice, the ability to keep two full years open at once, online help screens that explain error messages, footer text for invoices and purchase orders, and expanded address fields. Many other functions have been enhanced to make the product more flexible.

Entering transactions is easy. You pull down the menu you want (using either the keyboard or mouse), select the activity you want, and fill in the blanks in the dialog box or on the form provided (check, invoice, and so on). You can enter an unlimited number of transactions (including automatically recurring ones), add customers or vendors on the fly, and run a wide variety of reports, like Trial Balance, Balance Sheet, Income Statement, Aging, Payments, Products and Services, Price Break, and Product Activity and Alerts. If you want a graphic representation of a report, you can generate any of nine types of charts and graphs.

DacEasy Accounting can be used as a stand-alone. But if your needs are sophisticated enough, you may want to consider purchasing one of the program's add-on products: Payroll 4.3 (\$99.95) or Point of Sale 4.3 (\$149.95). DacEasy Accounting and Payroll can be purchased as a bundle; this Bonus Pack retails for \$199.95.

Instant Accounting's operations are divided slightly differently, by Customers, Vendors, General Ledger, Invoicing, Bank, Financials, Reports, Period



DacEasy's accounting programs aren't pretty, but they get the job done well.

End, and Backup/Restore. The DOS and Windows versions are practically identical in both appearance and functionality. You click on the module you want (both mouse and keyboard are supported in the DOS version), and the work area for that function appears, with icons representing the options available there. For example, in the Vendors module, you can scan the activity there, create a new record, write an invoice or debit memo, make a phone call or send a fax, write a letter or report, or print labels.

The two programs offer a similar core of features. You can use them to build databases of customers and vendors, write checks and send invoices, set up and track budgets, and compile and print reports. Each includes a sample chart of accounts, step-by-step written documentation, and online help; and both are based on double-entry accounting principles simplified for users who aren't financial professionals.

Instant Accounting was designed with the absolute novice or occasional user in mind; it's easier to navigate than DacEasy Accounting, and it's much less expensive. It's an excellent choice for someone who runs a small business and needs quick access to financial information. Instant Accounting's user interface is one of the most attractive and intuitive I've seen in any accounting software product.

DacEasy Accounting is more of a workhorse, though. It's not as pretty, but it can service much larger businesses with far more complex needs. The growth and flexibility provided by the add-on modules make it one of the most reliable products of its type.

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DacEasy Accounting 4.3: IBM PC or compatible, 640K RAM, hard disk with approximately 4MB free—\$149.95 for single-user version; \$299.95 for newbork version; \$60.00 for upgrade from DacEasy Light, DacEasy Instant Accounting, or a previous version of DacEasy Accounting

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FLIGHT SIMULATOR ADD-ONS

After a long, hard day, there's nothing like leaning back in your captain's chair, climbing to 5000 feet, and cruising with the clouds. I'm willing to bet, in fact, that Microsoft's Flight Simulator has headed off more nervous breakdowns than most \$200-an-hour shrinks. After hundreds of hours in the air over the same terrain, though, sometimes you've got to have a change. Luckily, there are plenty of add-on mod-

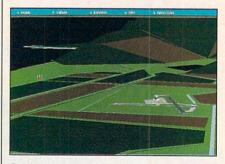
ules for Flight Simulator: not only new scenery but also computer-assisted flight planners, airport databases, pilots' logbooks, and much more.

One of the most prolific of the addon developers is Mallard Software. which boasts an impressive line of scenery disks and other enhancements. One of Mallard's recent offerings is the Hawaii scenery upgrade. In this tropical tour, you can sightsee from the air as you discover the mountains of Hawaii, the beach resorts of Maui, the shipwrecks of Molokai, the infamous Pearl Harbor, the canvons of Kauai, and more tourist attractions than the landbound can hope to see from their limited viewpoint. The package includes a small map of all the islands—even the tiny leeward islands—and a manual chock-full of tour suggestions. With this detailed scenery disk, your Hawaiian vacation may be closer than you think.

Besides its many scenery disks, Mallard produces handy utility programs for Microsoft's Flight Simulator. One, called Flight Planner, helps armchair pilots plot their courses, needing only the names of two airports to get the job done. You simply enter your departure and destination points, and the computer applies itself to the task, filling in

your flight plan with the information required to complete your trip. (If you like planning your own flights, Flight Planner also features a manual entry mode.) A database of airports and a pilot's calculator that figures wind correction, descent rate, and descent distance round out the package. Both DOS and Windows versions are included.

Mallard also markets a similar prod-



Don't go to therapy or a travel agency—fly to Hawaii or Great Britain on your PC.

uct called FS-Pro, which provides much of what is found in the Flight Planner package but with a more handson approach. For example, FS-Pro's flight planner isn't as automated as the one in the Flight Planner package. FS-Pro will, however, automatically calculate your initial heading and the distance between airports.

FS-Pro also features a series of ready-to-fly scenarios that you can select from FS-Pro's main menu. When vou choose a scenario (or adventure. as Mallard calls them), FS-Pro gives you a description of the challenge at hand and then automatically transfers you to Flight Simulator, with your engine humming and the scenario ready to go. In addition, FS-Pro includes a more powerful pilot's calculator than the one in Flight Planner, an airport and aircraft database, a pilot's logbook, an airport graphics editor, and a pilot's ground school, where you can learn the basics of flying.

Another company that produces add-ons for Microsoft's Flight Simulator (not to mention for its own flight simulator) is subLOGIC. The company's latest offering, the Great Britain Scenery Collection, comes with three disks, each packed with more than 300,000 square miles of new terrain for you to explore. With this package, you can wing your way over England, Wales, Scotland, Ireland, and other areas surrounding Britain. An excellent set of navigational maps is included, as is a plotting and navigational tool. The complete manual features navigation and information charts for more than two dozen major airports. An impressive package.

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NEW W\$RLD COMPUTING

strap in for a sky-high jaunt, you might consider adding one of these modules to your basic Flight Simulator. Chances are that you'll become so engrossed in exploring new worlds that you won't even notice your troubles blowing away like leaves in the wind.

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MAG **INNOVISION**

When I first opened the carton containing the MX17F, I expected to see a bigger version of MAG InnoVision's 15inch monitor, the MX15F. While there's an unmistakable family resemblanceboth share the same clean lines, for instance—there are other differences besides size and weight that soon became apparent.

This larger-screen unit boasts a fine .26-mm dot pitch. Like its sibling, it's capable of 1280 × 1024 noninterlaced resolution. The MX17F also comes with a detachable tilt-swivel base and rubber-tipped feet (in case you decide to forgo using the base).

At the rear of the MX17F, there's an AC power socket, along with two D connectors

for inputting the video signal. The input used with PCs and PS/2 machines is an elongated 15-pin D connector (two rows of holes instead of the usual three) that looks like a joystick connector rather than a video hookup.

A standard 15-pin D con-

display at the right side, flanked by an unobtrusive LED power indicator. At the left side you'll find rotary dials for adjusting brightness and contrast. Next to these dials is mounted a two-line. 32-character backlit display. with a drop-down door next to it concealing all the im-

The MX17F from MAG InnoVision packs lots of helpful features into a 17-inch monitor that will plug into just about any machine.

nector (the familiar three rows of holes) is also present, but this one's used for connecting the MX17F to Apple Macintosh II computers! If you want even more flexibility for using the MX17F, vou can also use the five discrete BNC connectors for inputting your video signals. A high/low (75-ohm) impedance selector switch is also located on the rear for tailoring the input signal strength.

All the real action takes place at the front of the monitor, however, since that's where you'll find all the useradjustable controls. A flushmounted power switch nestles comfortably beneath the age adjustment controls.

The LCD keeps the user constantly informed of the currently active video mode, with the top line (16 characters) displaying either Interlaced or Noninterlaced and the lower line (also 16 characters) showing the resolution and frequency (for example, 1024 × 768 70 Hz). This is a nifty feature that gives you instant confirmation of the mode you're running in.

The control panel next to the LCD contains a push-button switch for degaussing, along with eight additional push buttons divided into four pairs (decrease/augment) of controls. One pair

is used for each of the following: vertical size, vertical position, horizontal phase (position), and horizontal size. Another single push button to the right of this bank is used for storing and recalling memory settings. Next to the memory button is a two-position slider switch for selecting either user-programmed or factory-preset timing modes, and another slider switch for selecting either the BNC or D-subconnector inputs. The MX17F's nonvolatile memory comes with 13 preset modes and can also accommodate 8 user-programmed modes.

The monitor has an FCC Class B compliance certification for input signals with horizontal frequencies of 58 kHz or lower. It should be noted that this monitor isn't certified Class B for frequencies above 58 kHz because of a lack of Class B-compliant input devices that operate at such frequencies. In other words, monitors that operate in the MX17F's frequency range didn't exist when the Class B compliance standards were set. My, isn't it amazing how technology

has progressed!

The image quality and overall performance of the MX17F is more than acceptable, especially when the higher resolutions (1280 x 1024, 1024 × 768) are run with a video card capable of running in noninterlaced mode, such as the Renoir Ultra-SVGA I used. If there's a monitor in your future, the MAG InnoVision MX17F may fit the bill nicely.

TOM BENFORD

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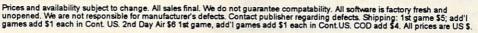
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REVIEWS

VIDEO POKER

Step into any Las Vegas or Atlantic City casino and prepare to be over-whelmed: video poker machines, as far as the eye can see, each adopted by a hopeful gambler looking for a lucky draw. Now, three software versions of this popular casino attraction allow players to hone strategies and have fun without risking the rent money.

Behind facades of flash and glitter, there's some intense number crunching going on. Each package takes the business of tracking odds, percentages, and payoff schedules very seriously. In addition, the simulations offer as much depth and detail as the user cares to indulge: fast and fun entertainment or meticulous tools with which to develop expert, workable strategies.

Features common to all three packages include Las Vegas and Atlantic City variations of the most popular casino machines: Draw Poker, Jokers Wild, and Deuces Wild. Most provide the option to change payback schedules and other values to create unique games. Other common features include multiplayer tournaments, onscreen strategic advice, hand evaluation tables, automated statistical play, and detailed game reporting. Each company has a Windows version of its product available or in development.

Of the three products reviewed, Stanford Wong's Video Poker makes the most effort to re-create the look and feel of a real casino machine. It's also the only game in the group to offer sound card support, adding atmosphere with digitized crowd noise and the incessant clinking of coins. On the other hand, the game's low-resolution, garishly colored graphics are authentic almost to the point of distraction. The game's many strengths include a unique split-screen, two-player tournament mode and the option to save multiple play sessions in progress. Another big asset is the ability to redefine and save custom machine configurations. Weaknesses are mostly cosmetic-cluttered screens and meager audiovisual feedback-coupled with a slow graphics display and poorly programmed mouse option.

Masque Video Poker trades bells and whistles for lightning speed and statistical prowess. As a token of its emphatic dedication to real-world strategy, the game simulates only "full pay" machines—units with unaltered payback schedules. Strong points include a detailed play history analysis, showing alternate outcomes to all hands

played against the computer's advice. The game is also highly configurable, with excellent mouse and hot-key controls. Beyond its narrow scope of machine simulations, the game's only weakness is its dour personality. If not for some rudimentary graphics and sound effects, you could almost mistake it for a spreadsheet.

Strategic Video Poker falls comfortably between a flashy arcade-style game and rigid statistical simulation. Featuring clean, high-resolution graphics and fast gameplay, this could be the one to beat. Strong points include the ability to play off credits—thus preserving your nest egg—and a unique "hand tester" to compute odds before committing to play.

The game also features 31 preset payoff configurations, players' session stats saved to disk, and the ability to print strategies for use in real casinos. Audio feedback is excellent, despite the program's having no sound card support.

Annoyed by the constant nagging of the computer strategist? Turn it off by playing smarter: The more you've learned, the less advice it gives. And unless you're a long-lost relative of "Diamond Jim" Brady, playing with a \$1,000 bankroll simply isn't realistic. Limiting your coffer to a reasonable amount adds excitement to winning and agony to defeat. As diehard gamblers say, "No threat, no thrills."

Overall, the only clear winners in this race are video poker enthusiasts. For both casual and serious players, all three products offer a wealth of entertainment and instructional value.

SCOTT A. MAY

Masque Video Poker: IBM PC or compatible, 256K RAM; mouse supported—\$49.95

MASQUE PUBLISHING P.O. Box 5223 Englewood, CO 80155 (800) 765-4223

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Strategic Video Poker: IBM PC or compatible; 512K RAM; Hercules, CGA, EGA, MCGA, or VGA; mouse optional—\$49.95

LWS SOFTWARE P.O. Box 688 Broomall, PA 19008 (800) 828-2259 (215) 520-9858

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Stanford Wong Video Poker: IBM PC or compatible; 512K RAM; CGA, EGA, MCGA, or VGA; hard disk recommended; mouse supported; supports Sound Master, Ad Lib, Sound Blaster—\$29.95

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REVIEWS

MAKEUP FOR WINDOWS

A buddy of mine dropped by today to show me a promo flier for his wife's gift shop. He'd created it on his PC, using standard dry-as-dust type fonts, and he made the mistake of asking my opinion.

"It's boring as day-old toast," I said. Uh-oh. Mr. Subtlety strikes again.

"I guess it does need work," my friend said. Then he asked The Big Question.

"Can you help?"
"Sure," I said. "All it really needs is a little MakeUp!"

MakeUp is a typographic specialeffects program from Bitstream. Remember what word processors did for writing? That's what MakeUp does for type. It lets your creativity run free, and all you need to make it sing is Windows and a 286-compatible PC.

MakeUp gives you complete control over basic type characteristics. No surprise there. But that's just the beginning. Imagine letters that seem to float above the page or appear embossed into it. Envision characters shaded so they appear to be made of polished metal. Picture words that stretch and twist and curve around complex shapes. The possibilities are endless. and MakeUp makes them happen.

Text entry—the first step—is easy. Simply draw a box and type in your characters. They're automatically fitted into the space you've outlined.

Then the fun begins. Want an embossed look? Click on the Emboss tool. Three-dimensional letters are equally easy. So is bending type around arches or circles or forming text blocks into complex shapes. You can even customize individual letters, perhaps to create a one-of-a-kind logo or a typeface of your own design. MakeUp gives you all the tools you need.

You can further enhance your creations by adding geometric shapes (circles, ovals, rectangles, polygons, and stars). There's even a Blend tool that transforms one word or shape into another, opening the door to some very unusual effects.

MakeUp also lets you "wash" type (individual letters or entire words) and objects with color or gray-scale washes. Colors can be specified using redgreen-blue (RGB), cyan-magenta-yellow (CMY), and hue-saturation-value (HSV) values. Pantone process colors can also be specified. You can't print color separations, but you'll have no trouble exporting files to separationcapable programs. In addition, MakeUp supports more than 20 different graphics formats.

Also very useful is MakeUp's support of Object Linking and Embedding (OLE), a Windows 3.1 feature that lets you edit and update objects directly from the application in which you placed the object.

MakeUp is supplied with an extensive clip art library and with five typefaces (Americana Bold, Bitstream Oz Handicraft, Poster Bodoni, Revue, and VAG Rounded) in three formats (Speedo, PostScript Type 1, and True-Type). Program setup automatically loads the Speedo fonts; you can load the PostScript Type 1 fonts with a fontscaling program such as Adobe Type Manager or load the TrueType fonts directly in Windows 3.1. Additional typefaces are available.

MakeUp's documentation is outstanding. The 276-page manual is highly readable, carefully organized, and lavishly illustrated. Also included is Make-Up Techniques, a separate guide which illustrates several effects and explains step by step how each was done.

If you've ever felt there's a type designer inside you, give MakeUp a try. Once it's installed, you can be doing real work in less time than it takes to read this review. Who knows? It might be just what you need to unleash your typographic talents on the world! STEVE HUDSON

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BERLITZ INTERPRETER

Who can follow in the Renaissance footsteps of those masters of multiple languages, the polyglots? Today, we feel lucky to keep up with all our electronic mail; unfortunately, time for language study remains very hard to find. Still, if you pine for the days of stronger vocabulary and more diverse wordplay, Microlytics has a working solution for you. Its Berlitz Interpreter puts a full 62,500 words at your disposal-50,000 of them in languages you probably don't speak. German, Italian, French, and Spanish—who could wish for a more diverse lexicon?

Invoke the interpreter—which runs equally well from Windows or DOS 5.0's task swapper—and you can issue commands with a few function keys. Say you want to know the Italian



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word for dog. Select English as the source language, type dog, and you have your translation: cane. You also receive the appropriate words in French (chien), Spanish (perro), and German (Hund), all with their respective genders noted. Lookup times pass without notice; in spite of decompression work, Berlitz Interpreter offers instant results. To make keyboard entry of those pesky alien characters-tildes and umlauts, for example-possible, Berlitz Interpreter allows you to choose them via cursor keys. Once selected, the appropriate character appears on the text entry line.

Berlitz Interpreter installs in less than 1MB of hard drive space, making it a prime candidate for notebook travels. The program even sports a quiz feature. Just choose a source language and type in your best guess for the word that appears. As you build your command of foreign languages, you'll see that they're not quite so foreign anymore (and not quite so enervating as hour-long games of laptop solitaire).

You may also summon the interpreter from within other programs: Lotus Works, Microsoft Works, Microsoft Word, WordPerfect, and WordStar. With helpful Berlitz Interpreter to prod your imagination, *love* soon turns to amore, and nausea gives way to Übelkeit. You need hardly stop typing to include these little gems, and your writing—at least your correspondence and your fiction—may profit by your exotic word gathering.

If you've ever studied a second language, chances are that some of that vocabulary remains locked in your memory. Berlitz Interpreter might just jog loose some key words while teaching you more than a few new ones.

For foreign-language first-timers, the sheer volume of available words might overwhelm, presenting choices too sweet. Limpid text files overburdened by inept locutions will surely litter the hard drive. Practice some caution, though, and the glamour passes, replaced by a strong sense of utility. In short, we can all profit from the exposure to new words, and Berlitz Interpreter provides a tireless tutor and worthwhile word fetcher for those of us who use computers.

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You'll immediately recognize the visual similarities between Guy Spy and the Crystals of Armageddon and Dragon's Lair. Knowing a good thing when it has one, Readysoft has pursued the interactive movie approach to gaming for some time now, and Guy Spy, while more or less as linear as its predecessors, offers much more action within each of its constituent episodes. At the Berlin train station, for example, Guy must dodge bullets and fire his own-arcade style. A life meter gauges his proximity to death, and when it comes, Guy reappears to blithely try again. That's a far cry from the makeone-mistake-and-you've-lost-a-quarter mentality of the original Dragon's Lair.

Guy's travels also bring him face to face with an animate mummy and take him on ski runs down grenade-pocked slopes, headlong into bar brawls, and, finally, to the Doomsday Tower for a vicious altercation with Von Max. Multiple backdrops and ample animation make these excursions into serial vérité a cartoonish pleasure; the engaging action renders this less an exercise in memorization than a playable game. Of course, to make Guy Spy more playable still, the designers might rethink the interface for the next installment-some system of movement allowing for simultaneous attacks would act as proof positive of Guy's superspy status.

For now, Guy Spy will capture the interest of anyone not already exhausted by other Readysoft adventures, and it stands well above the company's earlier efforts. Scads more fun than secret ciphers and far more heroic than selling atomic secrets, Guy Spy and the Crystals of Armageddon could give espionage a good name.

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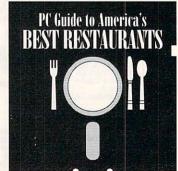
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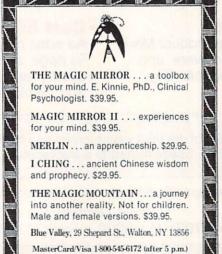


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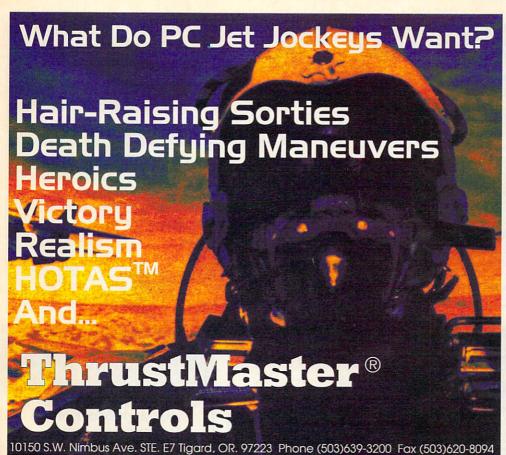
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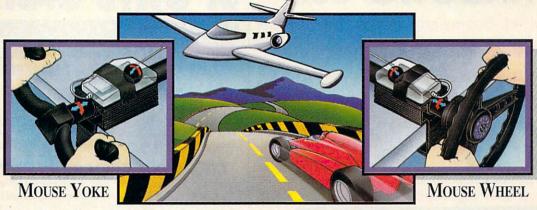
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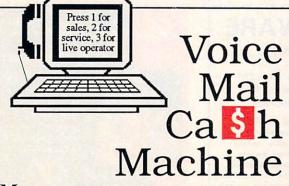
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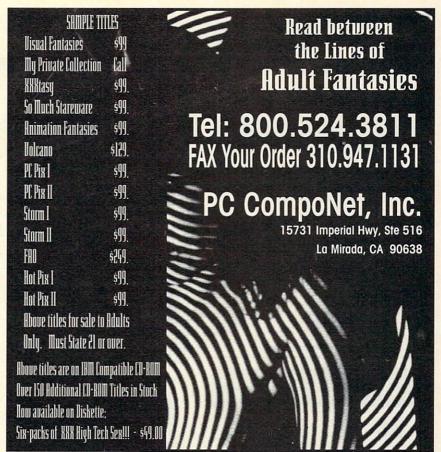
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Already, since the initial announcement, the prices of 1MB and 4MB chips have nearly doubled in the U.S. If

the Commerce Department finds that Korean DRAM chips were dumped, the International Trade Commission will have 45 days to determine whether the imports materially injured or threatened injury to the U.S. industry. If the ITC's findings are affirmative, the Commerce Department will order the U.S. Customs Service to collect antidumping duties that can run as high as 87 percent of the current DRAM price. The Commerce Department's final determination is expected this month. Stay tuned.

Intel-ligent Notebooks

Intel announced a family of Intel486 SL microprocessors that give PC manufacturers highly integrated, high-performance, power-efficient solutions for "next-generation" notebooks. The microprocessors allow full-featured notebook computers to convert to true 486 performance.

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Intel's 25-MHz version, currently in production, operates at 11 million instructions per second (MIPS); a 33-MHz version, which should be in production by the end of this month, operates at 14.5 MIPS. For more information, contact a local Intel sales office or the Intel Literature Center, Packet #D8P03, P.O. Box 7641, Mt. Prospect, Illinois 60056-6741; (800) 548-4725.

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Under the agreement, Cray's developmental T3D MPP computers will be installed at Los Alamos and Livermore by fall 1993 and will be connected over a highspeed data network to each other and to a system located at the Cray Research headquarters. The network will serve as a "distributed computing environment" for tackling industry problems, resulting in solutions that will increase productivity, reduce R&D costs, and improve manufacturing techniques for American companies. That will allow the U.S. to bring higher-quality products to market faster.

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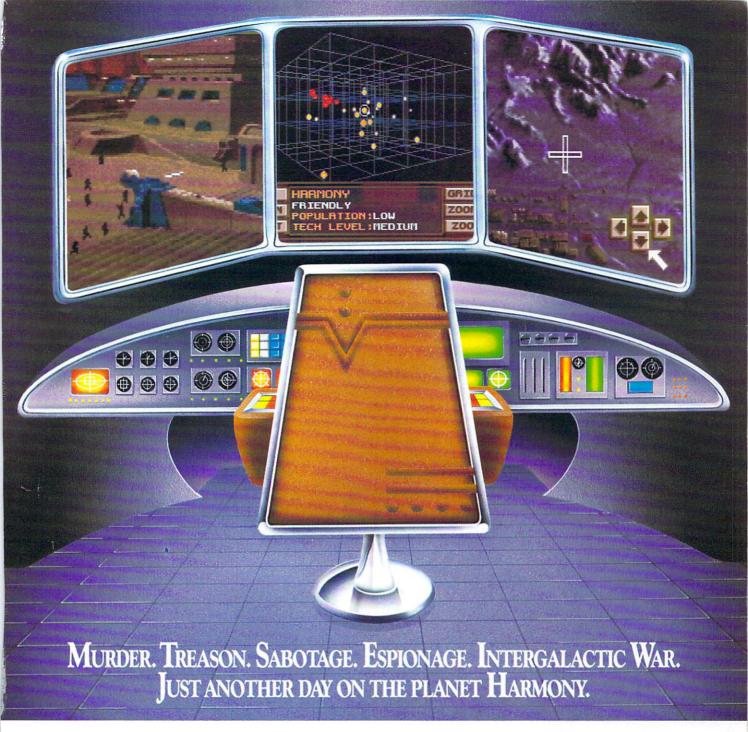
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